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USER'S GUIDE: COMPUTER PROGRAM FOR THREE-DIMENSIONAL ANALYSIS OF BUILDING SYSTEMS (CTABS80)

by

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report is a user's guide for CTABS80, a computer program for the linear three-dimensional structural analysis of multistory frame and shear wall buildings subjected to static or dynamic loadings.

In CTABS80, the building is idealized as an assemblage of vertical independent frame and shear wall systems interconnected by horizontal floor diaphragms which are rigid in their own plane. The frame and shear wall systems must basically be of rectangular geometry (in elevation) with (Continued)

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20. ABSTRACT (Continued)

vertical columns (or piers) and horizontal beams (or spandrels). However, with special modeling techniques, very complex situations may be considered. A special shear panel element is developed to enable modeling of discontinuous shear walls and shear walls with arbitrary openings. A diagonal bracing element to model braced frames (X-braced, K-braced, or eccentrically braced systems) is also presented.

The column, shear panel, and diagonal formulations include the effects of bending, axial, and shear deformations. Bending and shear deformations are also included in the beam formulation; however, the effects of axial deformations are neglected.

The effects of the finite dimensions of the beams and columns on the stiffness of a frame or shear wall system are automatically included.

The buildings may be unsymmetrical and nonrectangular in plan. Torsional behavior and interstory compatibility are accurately reflected in the results.

Four independent vertical and two independent lateral static load conditions are possible in any one run. These six static load conditions may be combined in any ratio to each other or to a lateral dynamic earthquake input which may be specified as a time-dependent ground acceleration or as an acceleration response spectrum.

Three-dimensional mode shapes and frequencies are evaluated.

The unique solution procedure used by CTABS80 considers the frame and shear walls as substructures, reduced with a modified wave front technique. This method results in a significant reduction in the program data preparation, computational effort, and storage requirements.

The consecutive levels of each of the individual frames can be arbitrarily connected to any (sequential but not necessarily consecutive) level of the structure, thereby making it possible for frames to bypass certain story levels, This option gives the program the capability to model partial diaphragms and multi-diaphragms at any level.

The theoretical basis of the program is presented in Waterways Experiment Station Technical Report K-81-2.

PREFACE

This user's guide documents a computer program called CTABS80 that can be used for static and dynamic analysis of multistory frame and shear wall buildings. Dr. Edward H. Wilson, University of California, Berkeley, was responsible for developing the original version of the program (TABS), sponsored mainly by a National Science Foundation Research Grant.

Modifications to the program to make it a more useful tool for Corps of Engineers' personnel were made by Mr. Ashraf Habibullah, Computers/ Structures International, Oakland, Calif. His work was sponsored with funds provided to the Automatic Data Processing (ADP) Center, U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss., by the Military Programs Directorate of the Office, Chief of Engineers, U. S. Army (OCE), under the Computer-Aided Structural Engineering (CASE) Project. This user's guide and a companion document describing the theoretical basis of CTABS80 are the work of Dr. Wilson and Messrs. H. H. Dovey and Habibullah.

Specifications for the modifications to TABS were provided by the members of the CASE Task Group on Building Systems. The following were members of the Task Group (though all may not have served for the entire period) during the period of modifications to the program:

Mr. Dan Reynolds, Sacramento District (Chairman)
Mr. Jerry Foster, Baltimore District
Mr. Joseph Hartman, St. Louis District
Mr. David Illias, Portland District
Mr. Sefton Lucas, Memphis District
Mr. Jun Ouchi, Pacific Ocean Division
Mr. David Raisanen, North Pacific Division
Mr. Pete Rossbach, Baltimore District
Mr. James Simmons, Baltimore District
Mr. Ollie Werner, Middle East Division
Mr. Gene Wyatt, Mobile District

Dr. N. Radhakrishnan, Special Technical Assistant, ADP Center, WES, and CASE Project Manager, and Mr. Paul K. Senter, Computer-Aided Design Group (CADG), ADP Center, coordinated and monitored the work. Ms. Deborah K. Martin, CADG, supported the Task Group in changing the program to accept free-field input. Mr. Seymour Schneider, Military Programs Directorate, was the OCE point of contact. Mr. Donald L. Neumann was Chief, ADP Center.

Directors of WES during this period were COL J. L. Cannon, CE, and COL N. P. Conover, CE. Technical Director was Mr. F. R. Brown.

CONTENTS

		Page
PREFACE		1
CONVERSION FACTORS, INCH-POUND TO METRIC (SI) UNITS OF MEASUREMENT		3
CHAPTER I:	INTRODUCTION	4
	A. Purpose	4
	B. General-Purpose Programs for Structural Analysis	4
	C. Special-Purpose Programs for Building Analysis	7
	D. Disclaimer	8
CHAPTER II:	SETTING UP INPUT DATA	9
	A. Reference Point and Reference Axis	9
	B. Load Conditions and Load Cases	9
	C. Story Data	11
	D. Frame Data	12
	E. Frame Location Data	15
	F. Dynamic Loading Data	16
CHAPTER III:	SPECIAL ASPECTS OF THE INPUT DATA	17
	A. Special Modeling Problems	17
	B. General Characteristics of the Elements	
	C. Program Limitations	
CHAPTER IV:	PROGRAM OUTPUT	
	A. Output Associated with the Complete Structure	
	B. Output Associated with Each Frame	
	C. Statics Check	
CHAPTER V:	PROGRAM CAPACITY	
	A. Calculating n_f	
	B. Calculating n_b	
	C. Calculating n_d	
CHAPTER VI:	DETAILED DESCRIPTION OF THE INPUT DATA	
CHAPTER VII:	EXAMPLES	
REFERENCES		
APPENDIX A:	CONTROL CARDS	A1
APPENDIX B:	CARD IMAGE LISTING OF EXAMPLE PROBLEMS	B1

CONVERSION FACTORS, INCH-POUND TO METRIC (SI) UNITS OF MEASUREMENT

Inch-pound units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
feet	0.3048	metres
inches	2.54	centimetres
kips (1000 lb force)	4.448222	kilonewtons
kips (force) per foot	14.593904	kilonewtons per metre
pounds (force) per square foot	47.880263	pascals
pounds (mass) per cubic foot	16.01846	kilograms per cubic metre

USER'S GUIDE: COMPUTER PROGRAM FOR THREE-DIMENSIONAL ANALYSIS OF BUILDING SYSTEMS (CTABS80)

CHAPTER I: INTRODUCTION

A. Purpose

This report is a user's guide for CTABS80, a computer program for the linear three-dimensional structural analysis of multistory frame and shear wall buildings subjected to static or dynamic loadings. The theoretical basis for the program is presented in Waterways Experiment Station (WES) Technical Report K-81-2 [18].

B. General-Purpose Programs for Structural Analysis

There are many two- and three-dimensional computer programs for the linear analysis of complex structures [1,2]. Most of these programs can be used for the static and dynamic analysis of multistory frame and shear wall buildings. However, most of these programs do not give special recognition to the fact that building systems in themselves are a very special class of structures from an analytical point of view. The following are some of the characteristics that are inherent in the nature of a building analysis that a general-purpose analysis program may not recognize, thereby resulting in significant losses in man-hours, computer time, and possibly accuracy:

1. Most buildings are of simple geometry with horizontal beams and vertical columns. A simple rectangular grid can define such a geometry

vertical columns. A simple rectangular grid can define such a geometry with minimal input. See Figure 1.

2. Many of the frames and shear walls are typical. Most general-purpose programs do not recognize this fact; therefore, the input may be large, and some internal calculations may be unnecessarily duplicated.

3. The in-plane stiffnesses of the floor systems of most buildings are very high. General-purpose programs do not necessarily recognize this, resulting in a set of equilibrium equations which may be very large, and thereby causing an increase in computation effort by a factor of 10 to 100. Also, numerical errors may be introduced since the in-plane floor stiffnesses are several orders of magnitude greater than the story-to-story stiffnesses of the structure. Since these two stiffnesses are added in a direct stiffness approach, double precision may be required in the solution.

4. The loading in building systems is of a restricted form. Loads, in general, are either vertically down (dead or live) or lateral (wind or seismic). The vertical loads are usually applied on the beams, and the lateral loads are generated at the floor levels.

5. In many buildings, the dimensions of the members are large and have a significant effect on the stiffness of the frame. Therefore, corrections need to be applied to the member stiffnesses. Most general-purpose programs work on center-line dimensions, and stiffness corrections are usually very tedious to implement.

6. In the dynamic analysis of buildings, the mass of the structure can be accurately lumped at the floor levels. Recognizing this fact

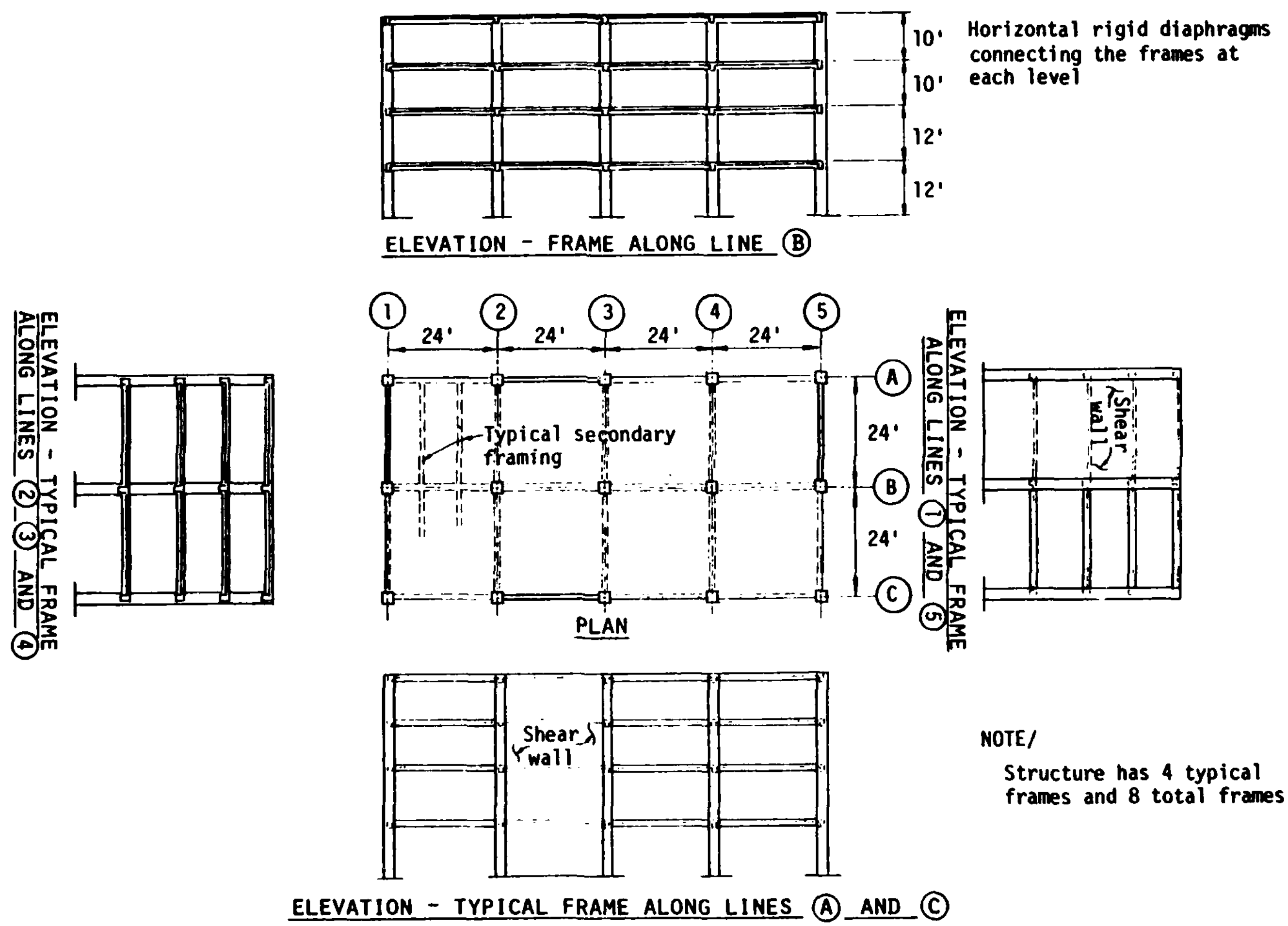


Figure 1. Typical frame and shear wall building

significantly reduces the size of the eigenvalue problem to be solved.

7. Various code loading requirements necessitate special options that allow convenient combinations of the vertical and lateral static and dynamic loadings. Also, the member forces need to be printed out at the support faces of the members. Such transformations are not automatic in general-purpose programs.

8. It is desirable to have a building analysis computer output printed in a special format; i.e., in terms of a particular frame, story, column, and beam. Also, special output such as story shears may be desirable.

In light of the above-mentioned and other reasons, the need for special-purpose programs for building analysis is apparent.

C. Special-Purpose Programs for Building Analysis

Various programs have been developed at the University of California at Berkeley for the linear analysis of multistory buildings in the past two decades [4,5,6]. These programs have been used in the profession on many major structures in many different countries. One of the major reasons for the development of computer program TABS [1,2,3] was the direct "feedback" from the profession in the use of these programs.

The first of these programs, FRMSTC, is a static load analysis program for symmetrical buildings with parallel frames and shear walls. Lateral mode shapes and frequencies are also evaluated.

Program FRMDYN is the same as FRMSTC except that the load input is ground accelerations due to a specified earthquake. Time-dependent displacements and member forces are produced but are not combined with static loads.

Program LATERAL is an extension of FRMSTC to the static analysis of a system of frames and shear walls which are not parallel. Three degrees of freedom exist at each story level. This program does not have dynamic options.

The first version of TABS was released in 1972, with the intent of replacing the computer programs described above. CTABS80 is an enhanced version of the original version of TABS and is intended to supercede other enhanced versions such as XTABS and TABS77.

The computer program ETABS [15] was released in 1975. The program allows three-dimensional frame input in which common column compatibility is enforced. The input data are more complex than those of TABS, and use of this program is only recommended if common column compatibility is important.

For buildings with other complexities, such as discontinuous or flexible diaphragms, sloped diaphragm, nonrectangular framing systems, etc., a general-purpose program such as SAPIV [12] or EASE2 [11] is still the most appropriate solution tool.

D. Disclaimer

Considerable time, effort, and expense have gone into the development and documentation of CTABS80, and the program has been thoroughly tested and used. In using the program, however, the user accepts and understands that no warrantly is expressed or implied, either by the sponsors, the developers, or the distributors, as to the accuracy or the reliability of the program. The user must clearly understand the basic assumptions of the program and must verify his own results.

CHAPTER II: SETTING UP INPUT DATA

This chapter will outline the steps that need to be taken and the data that need to be accumulated before the coding of the actual computer input can be initiated. Special terminology associated with the input and the output of the program is also described in the following sections.

A. Reference Point and Reference Axis

The reference point is an arbitrary point selected by the user in the plan view of the building. This point is the origin of the global X, Y axis and is the same for all levels of the structure. The story centers of mass, the structural lateral loads, and the positions of the various frames are all located with respect to this reference point and reference axis. The loading and geometry are thereby uniquely located with respect to each other, regardless of the choice of the reference point. The reference point may be chosen to be any dimensionally convenient point in the structural plan. See Figure 2.

B. Load Conditions and Load Cases

It is important to recognize the subtle distinction between a load condition and a load case as defined in the terminology of CTABS80.

The load conditions are the independent loadings for which the structure is analyzed internally. These loadings are: four vertical static loads conditions (I through IV), two lateral static load conditions (A and B), and three dynamic load conditions (1, 2, and 3).

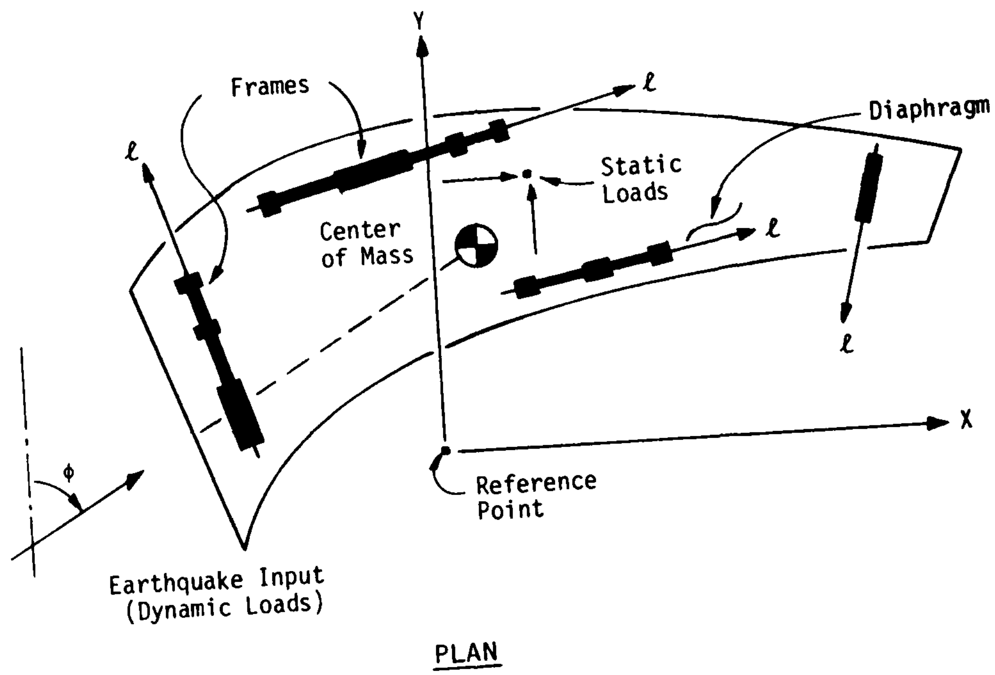


Figure 2. Typical story level

The user defines the loadings for the load conditions. The program <u>always</u> analyzes the structure for the <u>six static</u> load conditions in <u>every</u> run, no more, no less. If the user has not defined any loading in a particular load condition, a null load vector is used.

The dynamic analysis option, in the form of an acceleration response spectrum or time history, determines which of the three dynamic load conditions are active. See Chapter VI, Section 10, Note 1.

Nevertheless, load conditions are internal to the program. They are independent loadings that are never printed by the program.

The <u>load cases</u> are loadings that are assembled as linear combinations of the load conditions. These are loadings that are output by the program. Although the number of independent load conditions is fixed at nine (six for static runs), there is no limit on the number of load cases that may be formulated as linear combinations of the load conditions.

The lateral load conditions (1 through IV) are defined with the data associated with each frame.

Dynamic load conditions are defined by the earthquake excitation data.

C. <u>Story Data</u>

The first step in the data preparation sequence is to establish the story levels at which the horizontal rigid floor diaphragms will be located. The beams for all the frames must exist at these levels in each corresponding story. The story mass, mass moments of inertia, and the coordinates of the centers of the mass must be provided if any dynamic options are being activated. These data may be calculated by the program based on simplified

data provided by the user.

Lateral load data including magnitudes and points of application for each story level are needed for defining the lateral load conditions A and B. Lateral loads are applied at the floor levels. They act on the complete structure and are distributed to each individual frame in accordance with the stiffness and location of the frame.

Lateral static loads may be due to wind or earthquake. Tributary story wind loads must be calculated and provided by the user. The equivalent seismic static loads, based on the Uniform Building Code [14], can either be provided by the user or calculated internally by the program.

D. Frame Data

Since the program views the building system as an assemblage of vertical planar frames arbitrarily located in plan and interconnected to each other by horizontal floor diaphragms, the next step is to decompose the structure into a series of frames and determine which of the frames are typical (have the same geometry and vertical loading).

The floor levels of all the frames must be at the same height; however, all frames need not have the same number of stories. It is recommended that frame elevations be drawn of all the typical frames in the structure, such as shown in Figure 3.

The vertical loading tributary to a frame should be shown on the frame elevation. The vertical load data input for load conditions I through IV are prepared as part of the frame data. The self dead load of the frame can be accounted for automatically by assigning unit weights to the frame

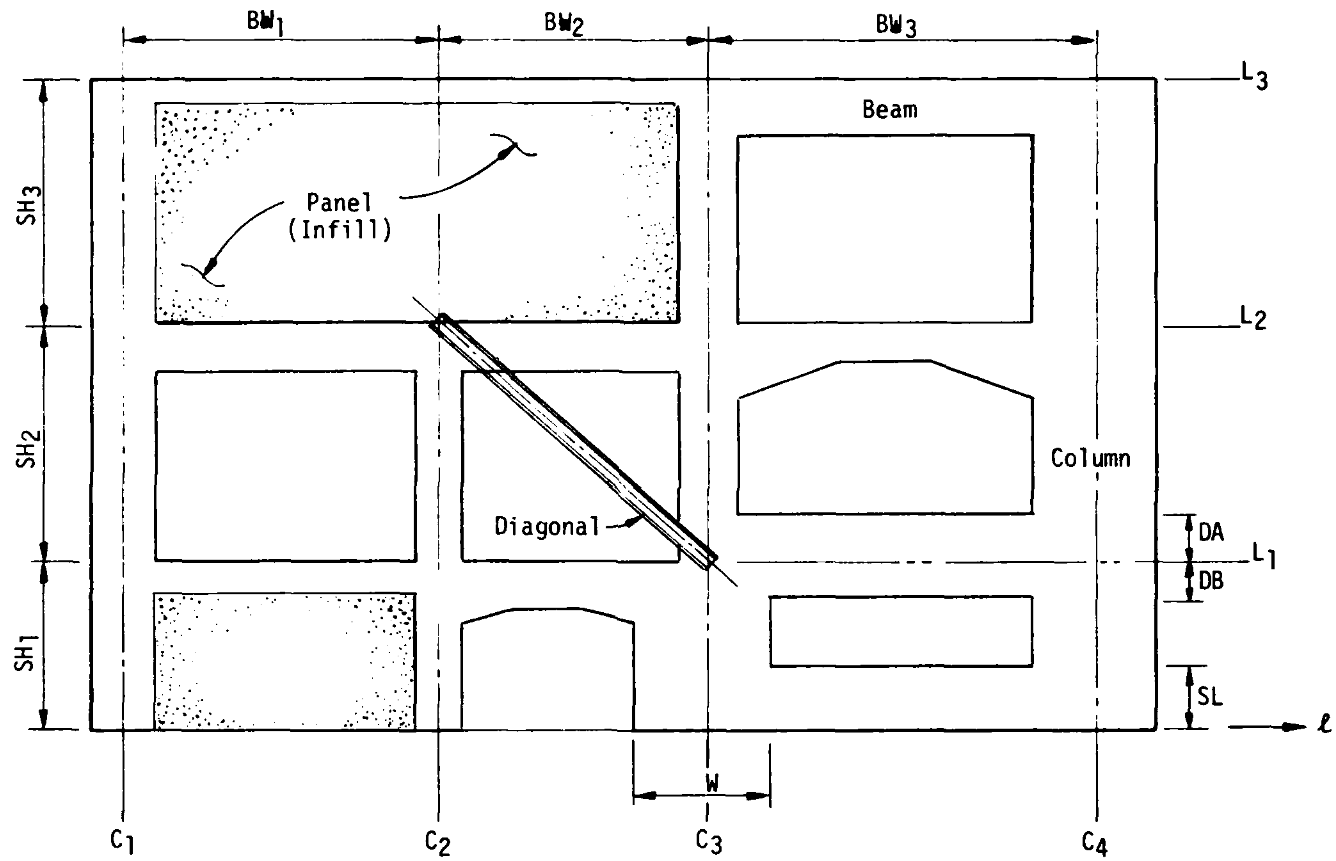


Figure 3. Elevation of typical frame

materials. The unit weight specification causes the frame self weight to be added into the load vector of load condition I. The unit weight does not cause any change in load conditions II through IV, nor does it affect the structural masses specified as part of the story data described in the previous section.

Each frame is assumed to have stiffness in one direction only, described by the direction ℓ in Figure 3. In other words, the out-of-plane stiffness of the elements of the frame is neglected. Elements which have stiffness in another direction must be defined by additional elements which are a part of a frame in the other direction. For example, columns that are common to two orthogonal frames are input twice, with the section properties associated with the corresponding directions. The axial deformations in these double columns will not be the same, and this common column incompatibility is one of the basic assumptions of the program. For tall structures (over 15 stories) this assumption will cause the structure to be more flexible. However, in short buildings, the axial forces in the same column from the two frames may be added directly to give reasonable results for design purposes.

The frames must be basically of rectangular geometry. The horizontal story levels and the vertical column center lines form the rectangular grid that is the basic reference system for the frame description. This grid work should be marked on the frame elevations previously drawn. The beams associated with a particular story exist at the corresponding story line, whereas the columns, panels, and diagonals associated with a particular story exist below the corresponding story line.

The column lines are numbered consecutively increasing in the positive ℓ

direction. The bays are distances between the column lines and must be numbered similarly. The number of bays is always one less than the number of column lines.

The rectangle formed by any two consecutive story lines and any two consecutive column lines is assumed to be an open bay. However, the bay may be plugged with a shear panel, making it possible to model framing systems resting on shear walls or shear walls resting on frame systems. Complex systems consisting of discontinuous shear walls and shear walls with arbitrarily located openings are effectively modeled via this shear panel using the special modeling techniques described in the next chapter. Any of the columns or beams may be omitted by providing zero properties, and the bays may be spanned by diagonal braces, allowing the modeling of X-braced, K-braced, or eccentrically braced systems. Modeling of A-frames is also possible.

The columns, beams, panels, and diagonals must be assigned property numbers, and these numbers should be displayed on the frame elevations being drawn.

The beam span loadings associated with the load conditions I through IV must be assigned pattern numbers, and these numbers should also be displayed on the frame elevations.

E. Frame Location Data

One set of frame data is set up for each <u>different</u> frame in the structure. Every one of the different frames may then be placed at one or more locations in the structure, via the frame location cards. These cards locate the local ℓ axes of the frames with respect to the global reference

axis. See Chapter VI, Section 6.

F. Dynamic Loading Data

The dynamic seismic loading input may be either in the form of an acceleration response spectrum or in the form of an accleration time-history input. These data are, in general, provided by the engineer responsible for the geotechnical evaluation of the building site. Time-history data and corresponding response spectrum curves of well known historical earthquakes are available in published reports [16].

Time-history data in card form for well known earthquakes are available from the National Information Service/Earthquake Engineering, University of California, Berkeley. Response spectra can be generated from time-history data using Reference 17.

CHAPTER III: SPECIAL ASPECTS OF THE INPUT DATA

The following sections will focus on some important aspects pertaining to the use of the program. Modeling of complex shear wall systems with the shear panel element, general points of caution associated with the use of each element, and the limitations of the program are specifically discussed.

A. Special Modeling Problems

(i). Simple Pier-Spandrel System

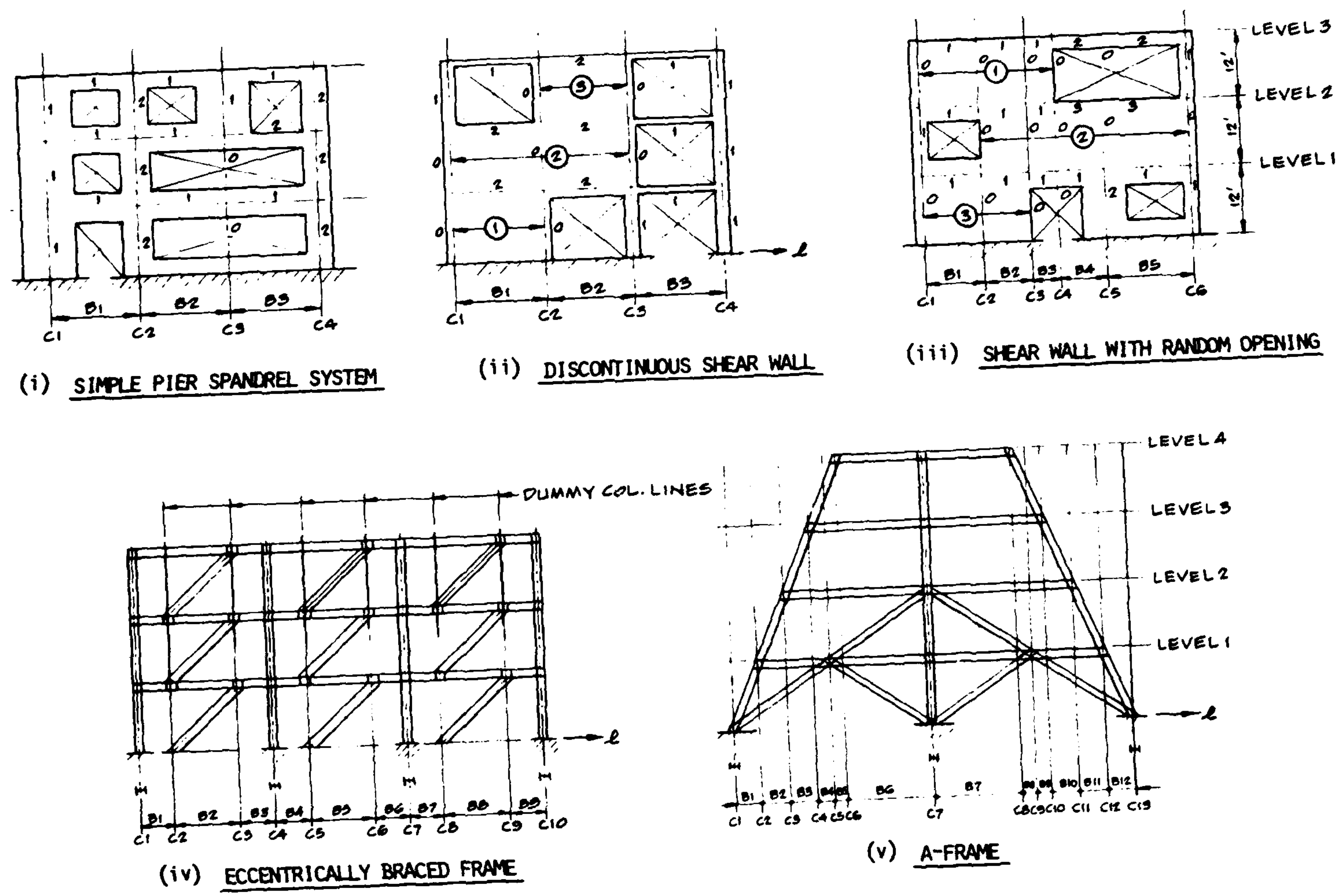
A pier-spandrel system is simply a beam/column system in which the dimension of the elements are large compared to the overall dimensions of the frame. Such systems are conveniently modeled with CTABS80 because the effects of the finite dimensions of the members on the stiffness of the frame are automatically considered. Figure 4 shows the model of a simple pier spandrel system.

(ii). Discontinuous Shear Wall System

A discontinuous shear wall system is also shown in Figure 4. The modeling of this system calls for four column lines and three shear panels. Details pertaining to the use of the shear panel are described below in Section B.

(iii). Shear Wall with Arbitrarily Located Openings

In modeling frames and shear wall systems, the vertical column lines do not necessarily have to represent center lines of columns (or piers). In modeling shear walls with random openings, such as shown



(i) SIMPLE PIER SPANDREL SYSTEM

(ii) DISCONTINUOUS SHEAR WALL

(iii) SHEAR WALL WITH RANDOM OPENING

(iv) ECCENTRICALLY BRACED FRAME

(v) A-FRAME

Figure 4. Special modeling situations

in Figure 4, the column lines are used also as basic reference lines to define the extent of openings and wall segments. The bays that are not open are infilled with shear panels. In the example, six column lines are sufficient to define the wall geometry. Note that column lines 2, 3, and 4 are located purely on the basis of the dimensions of the wall openings. Column lines 1, 5, and 6 are located on the center lines of piers. See Section B below for further details of shear panel usage.

(iv). Eccentrically Braced Systems, K- and X-Braced Systems, and A-Frames

By effectively using column lines for definition of the frames as shown in Figures 4 and 5, complex bracing systems can be conveniently modeled. The "dummy" column lines are for geometric definition only and must be assigned zero properties via the zero column location input.

(v). Foundation Flexibility

Vertical and rotational soil springs may be modeled under each column line of the frame by adding a "dummy" story to the structure at the foundation level. The properties of the beams and columns in this level are manipulated and input to simulate the desired restraint conditions. In such situations, the analytical results tend to be very sensitive to the input restraint conditions, and it is important that a practical solution to such problems be based on several analyses so that the sensitivities of restraint parameters are evaluated and their relative importance is established. See Figure 6.

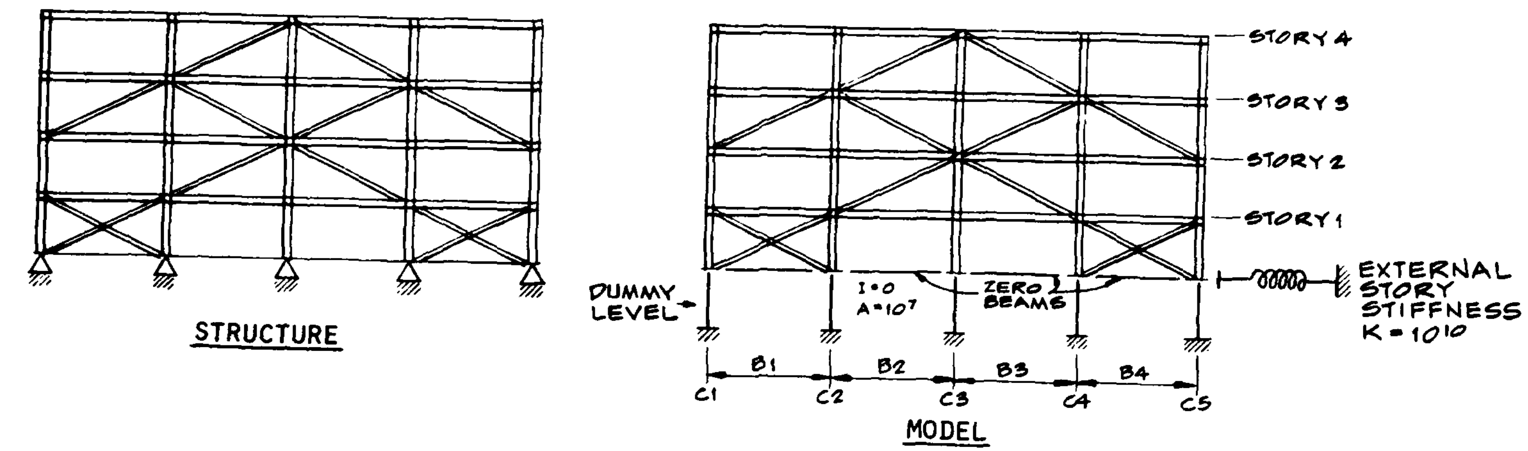


Figure 5. Modeling pin-base conditions (X-bracing and K-bracing)

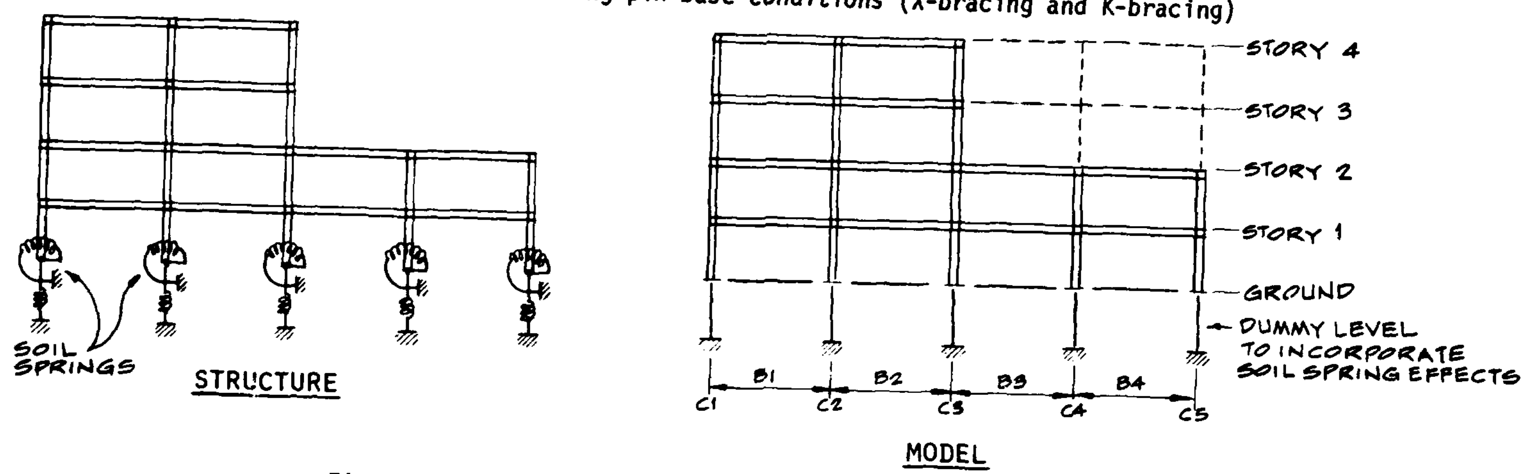


Figure 6. Modeling foundation flexibility (moment resisting frame)

(vi). Pin-Base Conditions

The program assumes that the boundary condition at the base of each column is fixed. However, pin-base conditions may be modeled by adding a "dummy" story to the structure at the foundation level. The beams at this level are assigned zero property identifications, and the columns are assigned a large axial area but a zero moment of inertia. If the columns are to be selectively pinned or fixed, a large moment of inertia, a large axial area, and a zero shear area should be provided in the "dummy" level of the columns that are fixed. The modulus of elasticity should be comparable to that of the material in the stories above.

The three components of the external story stiffness of the "dummy" level should be assigned a large value (10^{15}) to prevent the "dummy" level from spinning or translating. See Figure 5.

B. <u>General Characteristics of the Elements</u>

The following are some important characteristics of the elements that must be recognized by the user in order to correctly use, understand, and apply CTABS80:

(i). Column Element

1. The column width is assumed to be centered on the column center line.
2. The bases of columns in the lowermost story are assumed fixed.
3. Columns must be prismatic from floor level to floor level.

(ii). Beam Element

1. Beams need not be prismatic, but must be symmetrical about the bay center line.
2. Axial deformations in the beams are forced to zero by the assumption that a rigid diaphragm exists along the beam line. It should be noted that a zero specification for two consecutive beams at a particular level does not free the common joint. The rigid diaphragm is always there regardless of the presence of the beams, and the lateral displacement of the common joint is constrained to be the same as the displacement of all other joints at that level.
3. Any participation of the structural floors in the bending of the beams must be reflected in the properties of the beams (T-beam or L-beam action) provided by the user, if it is to be included in the analysis.

(iii). Panel Element

1. The panel element can exist between any two column lines (consecutive or nonconsecutive) between any two consecutive levels.
2. One panel element must span the whole series of consecutive bays that need to be infilled. In other words, there must be at least one open bay between panels existing at any one level.
3. In general, rigid beams (large moment of inertia, zero shear area) must always be provided at the story levels bounding the panel (i.e., above and below the panel).
4. The column lines bounding and within the panel area

should be assigned zero property identifications.

5. The panel is a vertical bending element. The bending in the panel is associated with horizontal shears. Therefore, using the panel to model situations which require bending deformations associated with vertical shears will lead to questionable results.
6. The panel stiffness is based upon a length equal to the story height with no rigid zone offsets due to the depths of the beams existing on either side of the panel.

7. Panels in the lowermost story are assumed fixed at the bottom.

(iv). Diagonal Element

1. The diagonal element has axial, bending, and shear stiffness, just like the column and panel elements. A zero moment of inertia will degenerate the diagonal to an axial brace.
2. The diagonal can exist between any two column lines (consecutive or nonconsecutive). The diagonal can hook up any two column line/floor line intersections at any two consecutive levels.
3. The diagonal has no rigid zone offsets for stiffness corrections.

C. Program Limitations

CTABS80 is a special-purpose program for building analysis. It is currently the most efficient and effective tool for analyzing building systems that

fall into the category of "TABS" type buildings. CTABS80, however, is not the answer to all building analysis problems. The following are some of the limitations of the program:

(i). If floor diaphragm deformations are significant, results from a CTABS80 analysis may be questionable. Diaphragms are assumed to be infinitely stiff in plane.

(ii). CTABS80 does not capture "tubular" behavior that exists in tall structures with closely spaced columns. In other words, common column axial compatibility is not enforced, and the floor diaphragms do not transfer vertical shears.

(iii). All frames modeled with CTABS80 must exist in vertical planes. Frames have in-plane stiffness only, and no torsion can be carried by any of the elements in the frame.

(iv). The floor diaphragms must be continuous and horizontal at all levels. The diaphragm at any one level is assumed to hook up to all column lines at that level. Therefore, a partial diaphragm that connects to only a few of the column lines at any level, such as a mezzanine level, cannot be modeled with CTABS80.

(v). In braced frames, the diagonal axial behavior may cause large axial forces in the beams. It is possible to obtain these axial forces by statics, but they are not output by the program since the rigid diaphragm assumption causes the axial deformations in the beams to be assumed zero. In reality, these beams do have axial deformations and neglecting them could affect the results.

(vi). CTABS80 can model a shear wall (with openings) as an assemblage of beam and column elements (having bending and shear deformations) with rigid offsets to account for the effects of the finite dimensions of the

members on the stiffness of the frame. However, attempts to describe small wall openings (such as those required for duct and pipe penetrations) as bays encompassed by wide columns and deep beams can introduce modeling difficulties into the analysis, resulting in unrealistic results. In general, it is better to ignore small openings. The loss of accuracy in neglecting them is much less than it is in trying to incorporate them into the structural model.

CHAPTER IV: PROGRAM OUTPUT

The input data are echoed back in a labeled and tabulated form as the first section of the computer output. In addition to the echo of the input data, it is possible to obtain the following output from the program:

A. <u>Output Associated with the Complete Structure</u>

(i). Calculated structural dynamic properties; viz., masses, mass moments of inertia, and centers of mass.

(ii). Structural mode shapes and periods and modal participation factors.

(iii). Lateral seismic static equivalent loads, per the Uniform Building Code of 1979.

(iv). Lateral story displacement at the center of mass of each story for the six load conditions I, II, III, IV, A, and B. Sign convention shown in Figure 7.

(v). Maximum inertia forces and torsions generated at the center of mass of each level in every mode in a response spectrum dynamic run.

(vi). Summary of the structural story shear distribution to the various frames, story-by-story, frame-by-frame.

(vii). Plots of the structural plan showing location of the frames. These plots may be obtained either on a passive plotter or on an interactive graphics terminal.

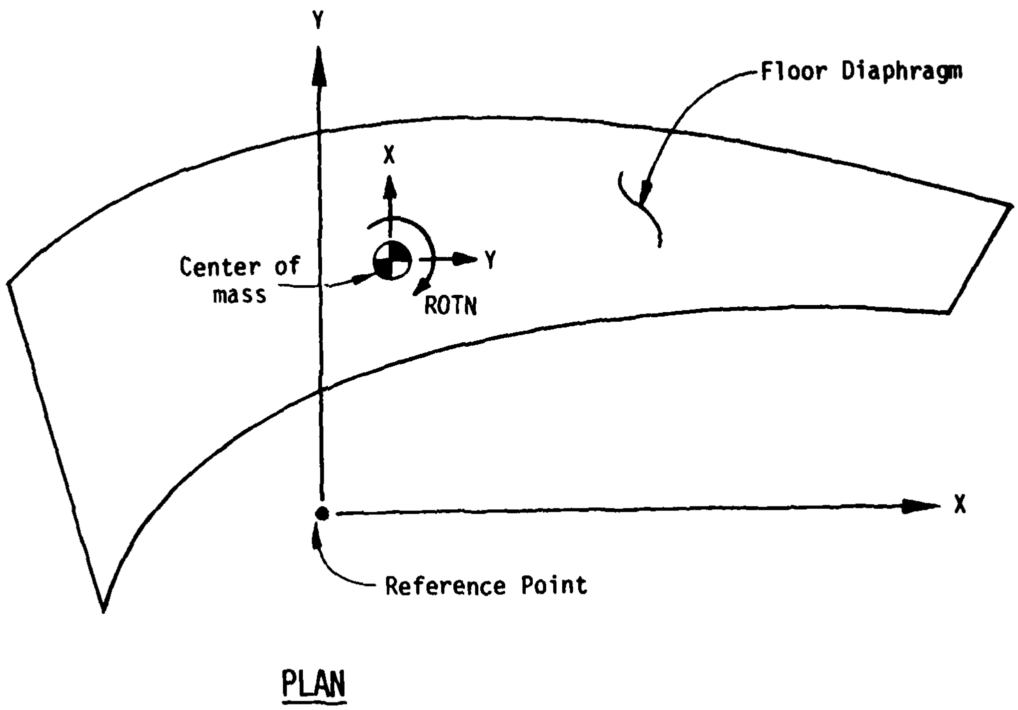


Figure 7. Positive directions for structural lateral displacements

B. Output Associated with Each Frame

(i). Summary of vertical loading applied to each frame, level-by-level.

(ii). Lateral frame displacements in the plane of the frame. Vertical displacements and rotations at each column line, level-by-level. Sign convention is shown in Figure 8 . Dynamic displacement printer plots are output in time-history runs for the lateral frame displacements.

(iii). Member forces (output on TAPE 6) and member stresses (output on TAPE 9) for each element type. Element force components along with the sign convention are shown in Figure 9 . Bending stresses are based on the gross section moment of inertia. Axial stresses are based upon the axial area and shear stresses are based upon the shear area (5/6 of axial area for rectangular sections). The member stress units maybe different from the member force units, if requested. Column moments are printed at the outer faces of the beams framing into the column at the corresponding level. Beam moments are printed at the outer face of column at the corresponding end. The beam span moment is an average of the beam end moments for the lateral and the dynamic load conditions and for the vertical load conditions if the beam span has no vertical loading specified. If, however, vertical loading is specified, a search is conducted for a point of zero shear in the beam. The moment is calculated at the first point of zero shear encountered from the left end of the beam. However, if no point of zero shear is found, the moment is set to the average of the beam end moments. Bending moments for the panel are evaluated at the outer faces of the beams. Bending moments for the diagonals

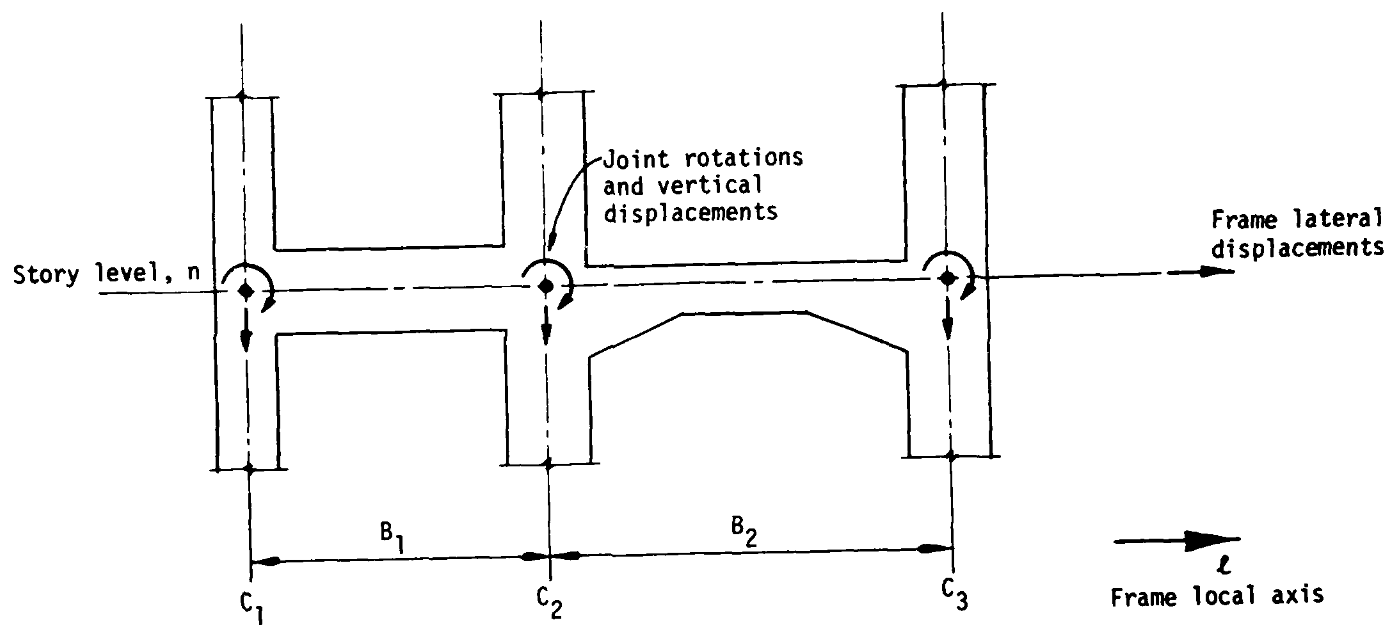


Figure 8. Positive directions for the frame displacements

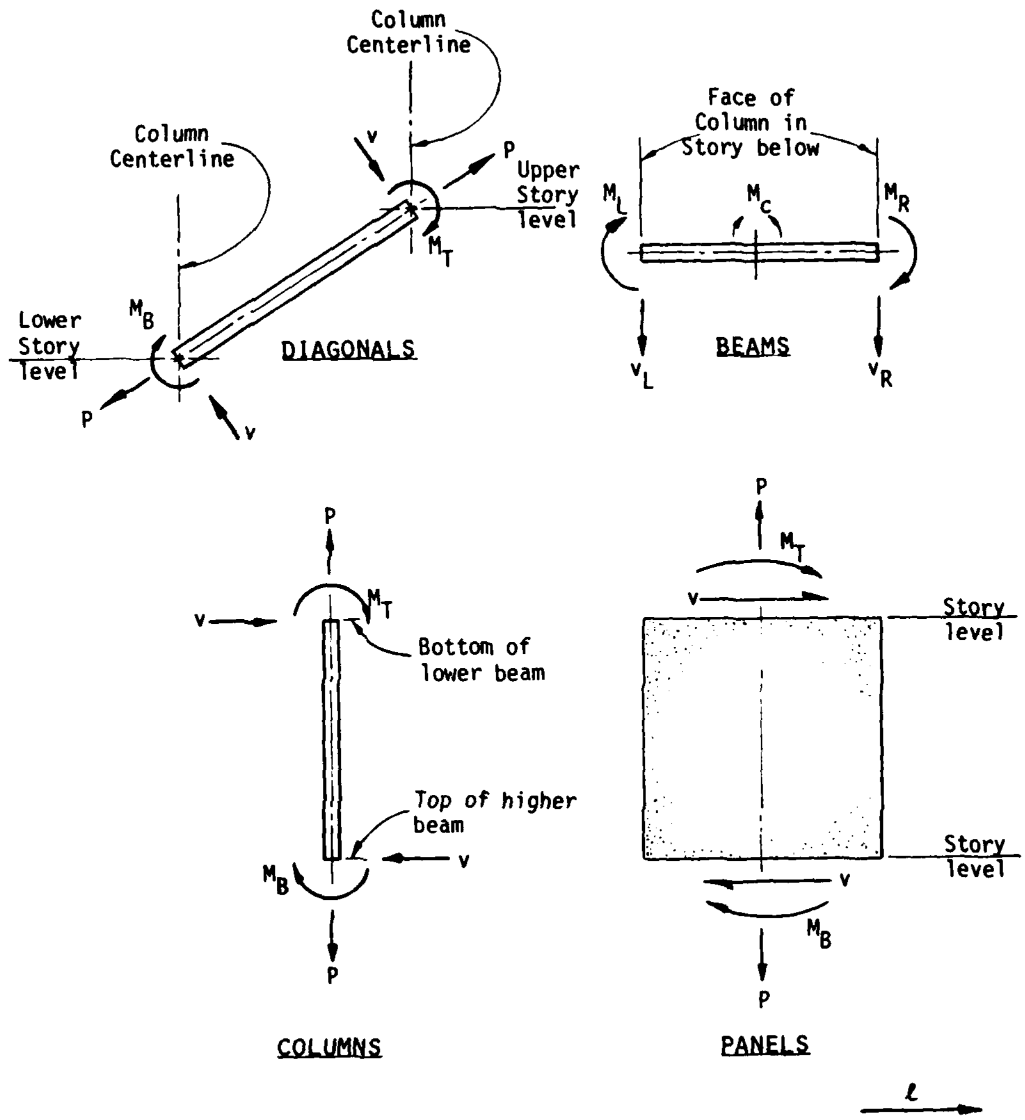


Figure 9. Positive directions for the element member forces

are at the end column center lines.

(iv). Story shear summary at each level for the static load conditions I, II, III, IV, A, and B.

(v). Pen plots of the frame elevation.

The frame output sequence is in the reverse order of the frame input sequence in the frame location data, Chapter IV, Section 6. Output associated with the last frame is printed out first starting with the lowest story and progressing upwards.

C. Statics Check

Results from all static load conditions must satisfy statics. However, as the column and beam moments are evaluated at the out faces of the supports of each of the corresponding members joint moment equilibrium is not readily obvious. Checking joint statics involves transformation of the column and beam moments to the point of intersection of the corresponding column line and story level. Statics will be satisfied once all moments are transformed to this common point. It is obvious that the beam and column shears and the finite dimensions of the joints will need to be a part of the moment equilibrium equations. An illustration of joint static equilibrium is presented in Figure 10.

Results from all dynamic load conditions, in general, will not satisfy statics. In the response spectrum analysis, the analysis technique involves the summation of the modal components by methods which cause the signs of the resultant parameters to be lost. In the time-history

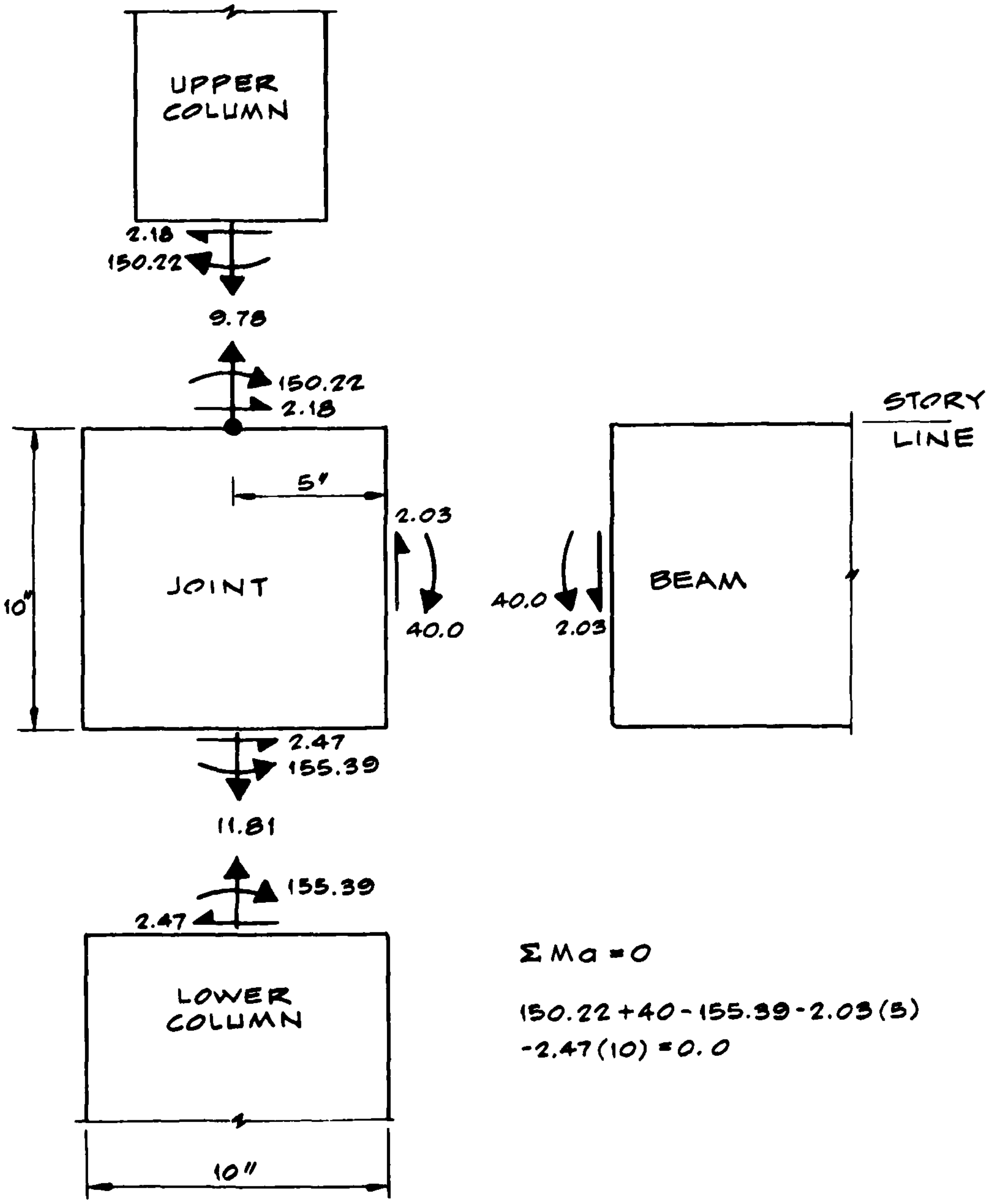


Figure 10. Joint static equilibrium

analysis, absolute maxima of the displacements and member forces are printed, thereby causing the sign to be lost. Besides, these maxima may not exist at the same instant in the analysis time span.

CHAPTER V: PROGRAM CAPACITY

CTABS80 is written in FORTRAN IV with dynamic storage allocation for all major arrays in blank COMMON. Therefore, the capacity of the program may be varied by altering only the following two cards that exist at the beginning of the main program:

```
COMMON     A(n)
DATA MTOT  /n/
```

The value of n for a particular problem must be greater than n_f, n_s, and n_d, the values of which are established by the formulae presented below. These parameters represent storage requirements at the major bottlenecks of the program. Other storage bottlenecks also exist in the program which, in general, seldom govern. Nevertheless, if the value of n specified on the cards shown above is not sufficient, the program will terminate execution and print out the required increase in storage to continue beyond the current checkpoint.

A. Calculating n_f

The storage required to process any one of the frames is given by:

$$\begin{aligned} S_f = \; & NS*(5*NB+NC) \\ + \; & 8*(NBP+NCP+2) \\ + \; & NFEF*(2*MCONL+8) \\ + \; & 4*(NPAN+NDIG) \\ + \; & 2*NB \\ + \; & \text{maximum of } (M_i \;\&\; M_o) \end{aligned}$$

where M_i = 20*NST + NN*(NN+3) + NC + NST*NDF

and M_o = (MLD+2)*NST + 11*NLD + NN*(2*NC+MLD) + NST*NDF

for a response spectrum analysis add an additional NFQ*(NFQ+11) to the value of M_o

n_f is the maximum of all the S_f values calculated for each frame

B. Calculating n_b

For the complete building the storage n_b is given by:

$$n_b = 19*NST + NSS*(2*NSS+3)$$

C. Calculating n_d

In a dynamic time history analysis the storage required is n_d and is given by:

$$n_d = 19*NST + (5+NTIME) * (NSS+NST) + NTF*(9+NST)$$

where:

NST = number of stories in the building

NS = number of stories in this frame

NC = number of column lines in this frame

NB = number of bays in this frame (equal to NC - 1)

NBP = number of beam property sets in this frame

NFEF = number of beam span loading patterns in this frame

MCONL = maximum number of point loads in any one beam span loading in this frame

NPAN = number of panel elements in this frame

NDIG = number of diagonal elements in this frame

NN = 4 * NC + NS + 1

NSS = 3 * NST if three degrees of freedom per story are allowed in the analysis

= NST if only one degree of freedom per story is allowed in the analysis

NTF = total number of frames in the building

NTIME = number of sampling values in the time history analysis

NLD = number of load cases in the analysis

NFQ = number of modes requested

MLD = 5 for static analysis only

5+NFQ for response spectrum analysis

5+NTIME for time history analysis

For buildings in which the number of stories is small, n_f will usually govern, if only one degree of freedom per story is allowed in the analysis, but n_b may be the critical value if three degrees of freedom per story are allowed. n_d may be critical if a large number of sampling times are requested.

CHAPTER VI: DETAILED DESCRIPTION OF THE INPUT DATA

There are basically eleven steps involved in the description of the CTABS80 input data. The sequence of the steps is summarized in the flowchart shown in Figure 11. The execution of these steps should result in a deck setup as illustrated in Figure 12. Each step is identified by a number, one through eleven, in Figure 11. Each step is described below in detail in a section having a corresponding section number.

The input data description provided in this user's guide is directed to execute the program in a batch mode. The program was modified by the WES ADP Center to allow timesharing mode of operation with data input from a file in free field format. Thus, the references to fixed field format no longer apply when using the program. To create a data file in free field format, simply input a line number, a blank space, and the data items in sequence in the line. The data items must be separated by a blank space or a comma.

1. COMMENT CARDS (A1,17A4,A1)

Columns	Note	Variable	Entry
1	(1)	IDLR	The "$" sign
2-70		ICARD	User convenience information

NOTES/

1. Comment cards are cards that the user may insert in the data for identification convenience. These cards may occur anywhere in the data. The program will ignore them as long as there is a "$" sign in column 1.

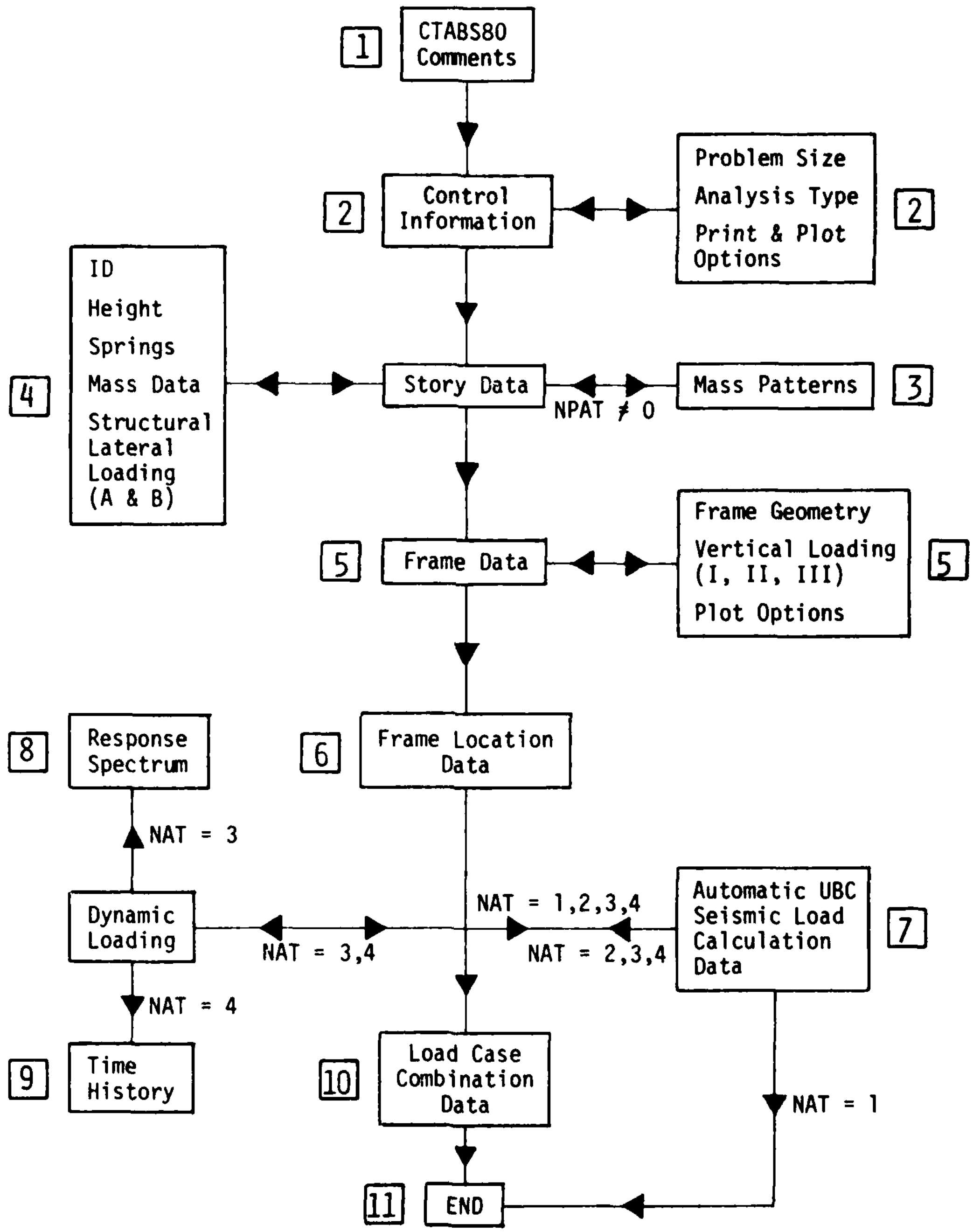


Figure 11. Flowchart for setup of input data

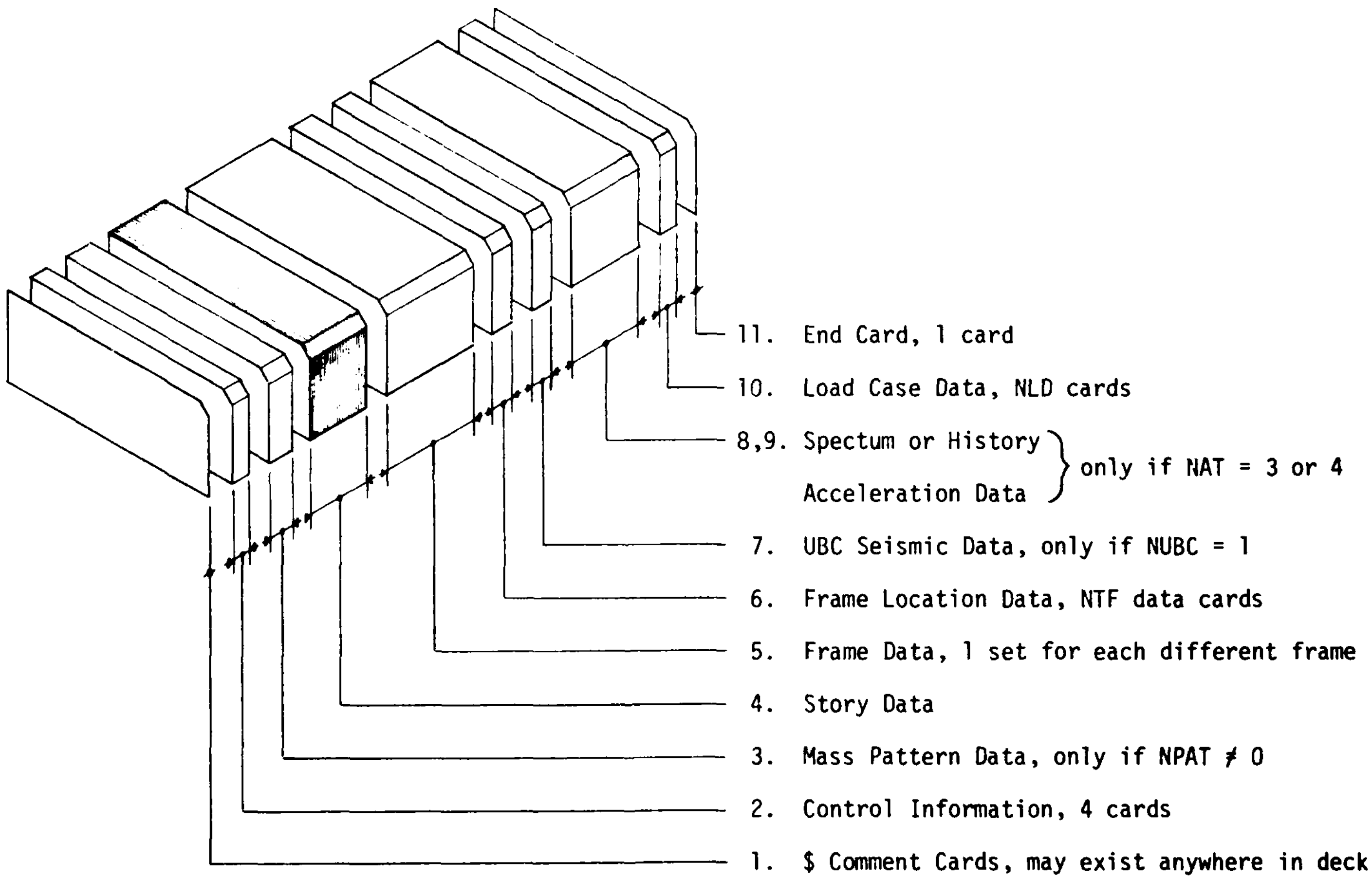


Figure 12. Typical deck setup

2. CONTROL INFORMATION CARDS

Prepare four cards for the whole building as follows:

a. First Two Cards (14A5/14A5) Heading Cards

Column	Note	Variable	Entry
1-70	(1)	IHED	Building identification information to be printed with the output.

NOTES/

1. These two lines are printed as heade information on every output page.

Control Information Cards (continued)

b. Third Card (12I5) Control Data

Column	Note	Variable	Entry
1-5	(1)	NST	Number of stories in complete building
6-10	(2)	NDF	Number of frames with different properties or different vertical loading
11-15	(3)	NTF	Total number of frames or shear wall systems in the structure
16-20	(4)	NLD	Total number of load cases
25	(5)	NAT	Analysis type code: EQ.0; Static analysis only EQ.1; Mode shapes and periods only EQ.2; Static load analysis and mode shapes and periods EQ.3; Lateral earthquake spectrum analysis in addition to analysis type 2 EQ.4; Lateral earthquake history analysis in addition to analysis type 2
26-30	(6)	NFQ	Number of periods to be calculated
35	(7)	NSD	Allowable story degrees of freedom: EQ.0; X,Y translations and story rotations EQ.1; X translations only EQ.2; Y translations only
40	(8)	NOPT	Execution mode: EQ.0; Normal execution EQ.1; Data check mode, no calculations Program stops after input echo of the data EQ.2; Complete execution, but only static structural displacements and summary of static story shears is output. No input echo EQ.3; Complete execution and printout; however, no input echo
45	(9)	NRGD	Frame joint rigid zone control: EQ.0; Modify rigid zone EQ.1; No reduction in rigid zone dimensions

Control Information Cards (continued)

Column	Note	Variable	Entry
50	(10)	NDSP	Frame joint displacement code: EQ.0; Suppress frame joint displacements EQ.1; Print joint vertical and rotational displacements
55	(11)	NUBC	Automatic lateral seismic force calculation flag UBC 1979 (or SEAOC) code: EQ.0; No automatic UBC load calculation EQ.1; Modify load conditions A and B to reflect UBC 1976 seismic loads
60	(12)	NPAT	Number of story mass types EQ.0; No automatic mass, mass moment of inertia and center of mass calculations
65	(13)	NPLT	Master plot flag EQ.0; Do not plot EQ.1; Plot frame elevations and plan EQ.2; Plot frame elevations only EQ.3; Plot plan only

NOTES/

1. The number of stories in the building is the number of levels above the ground level.

2. Input data for frames with identical properties and vertical loading need only be prepared once.

3. The NTF total frames consisting of NDF different frames, are located via the frame location cards (Section 6) below. NTF is always greater than or equal to NDF.

4. Load cases are defined as linear combinations of the eight basic load conditions. See load case definition data (Section 10) below.

5. NAT basically defines the type of analysis being performed, thereby controlling the type of loading data required by the program in the input stream. Mass properties of the structure are not required for analysis type 0.

6. The number of frequencies must be less than the number of stories times the number of degrees of freedom per story.

7. This option allows the user to lock the plan torsional rotation of the floor diaphragms, thereby enabling the user to study the effects of the floor rotations on the behavior of the structure. In cases of symmetrical structures with loadings that cause no story rotations, the capacity and speed of solution of the program is improved if the story rotation is set to zero, i.e., NSD is 1 or 2.

8. Normal execution includes complete input data echo and complete output. It should be noted that NOPT should not be set equal to 2 in a dynamic run, as this option will suppress all output associated with the dynamics.

9. The rigid zone modification (25% reduction) is defined in Chapter II, Section A(iii) of the theoretical manual [18].

10. Frame joint vertical displacements and rotations are printed level by level for each frame if NDSP equals 1. The volume of the output is approximately doubled by triggering this option.

11. If NUBC equals 1, extra data defined in Section 7 below are required.

12. This variable controls the number of data sets to be provided in Section 3 below.

13. If NPLT equals 0, no plot output file is created and the frame plot flags (Section 5.b.) are ignored. If NPLT equals 2 or 3, the frame elevations of only those frames having active frame plot flags (See Section 5.b.) are plotted.

c. <u>Fourth Card</u> (2F10.0) Stress Transformation Data

Column	Note	Variable	Entry
1-10	(1)	ANI	Number of stress units in input length unit: EQ.0; Default set to 1.0
11-20		ANP	Number of stress units in input force unit: EQ.0; Default set to 1.0

NOTES/

1. Every member force has a corresponding member stress, such as, axial force/axial stress, shear force/shear stress, bending moment/ bending stress, etc. Member forces are output on the standard output file with all the other data, (TAPE 6). However, the corresponding stresses are simultaneously printed on an alternate print file, (TAPE 9).

   The stresses may be obtained in units other than those of the member force units. In other words, if the forces are output in kip foot units and all the stresses are prefered in pounds per square inch (psi), ANI should be set to 12.0 and ANP should be set to 1000.0.

3. DATA FOR CALCULATION OF STORY MASS, MASS MOMENT OF INERTIA AND CENTER OF MASS

Skip this section if NPAT (Section 2.b.) equals 0; otherwise, provide one set of data (a and b below) for each of the NPAT mass types. Each mass type is descretised as a series of NSEG rectangular segments, each having its own mass AM uniformly distributed over an area BB by DD. See Figure 13.

a. First Card (2I5,F10.0)

Column	Note	Variable	Entry
1-5	(1)	M	Mass type identification number
6-10	(2)	NSEG	Number of rectangular segments defining mass distribution
11-20		SF	Scale factor LE.0; Set to 1.0

b. Segment Data Cards (5F10.0)

Provide NSEG data cards as described below:

Column	Note	Variable	Entry
1-10	(3)	AM	Mass of rectangular segment
11-20	(4)	XC	X distance of center of mass of this segment from the reference point
21-30		YC	Y distance of center of mass of this segment from the reference point
31-40	(5)	BB	B dimension of rectangular segment
41-50		DD	D dimension of rectangular segment

NOTES/

1. Mass type numbers must start with 1 and increase consecutively.

2. The story is discretised as a series of rectangular segments each

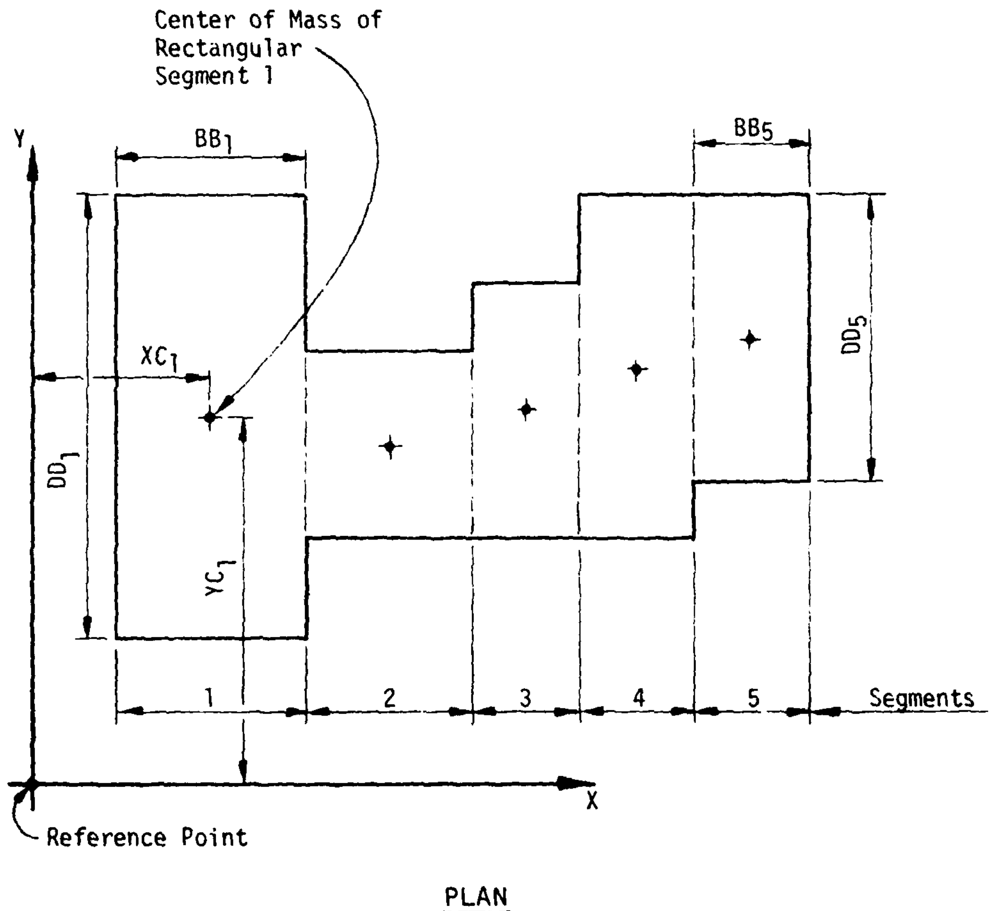


Figure 13. Example of mass type having 5 segments

having a mass AM, B, and D dimensions and X and Y distances from the reference point. From these data the program calculates a total mass, center of mass coordinates from the reference point of the complete system and a mass moment of inertia about a vertical axis passing through the center of mass of the complete system. There is no limit on the number of rectangular segments used to define a mass type.

3. Mass has units of force divided by gravitational acceleration (W/g).

4. The reference point and reference axis are defined in Chapter II.

5. BB and DD are the two dimensions of the rectangle. BB and DD need not be parallel or perpendicular to the reference axis.

   If BB is zero, the mass is a line mass of length DD

   If DD is zero, the mass is a line mass of length BB

   If both BB and DD are zero, the mass is a point mass

4. STORY DATA

Prepare four cards for each story level in sequence from the top to the bottom of the structure, i.e., four cards followed by four cards, level by level.

a. First Card (A5,I5,3F10.0) Structural Story Data

Column	Note	Variable	Entry
1-5		SDI	Five characters to be used for identification of this level
6-10	(1)	IMST	Mass type, not used if NPAT equals 0 (Section 2.b.): EQ.0; Mass properties of this story are as input on second card below GT.0; Mass properties are those of mass type IMST, as previously defined
11-20	(2)	SH	Story height distance from the floor (or roof) level to the floor (or foundation) level below
21-30	(3)	SKX	External story stiffness in the X direction
31-40		SKY	External story stiffness in the Y direction
41-50		SKR	External story stiffness in the story rotational direction

b. Second Card (4F10.0) Structural Mass Data

Column	Note	Variable	Entry
1-10	(4)	XMASS	Translational mass
11-20	(5)	XMMI	Rotational mass moment of inertia of the story about a vertical axis through the center of mass of the story
21-30	(6)	XM	X distance to the center of mass measured from the reference point
31-40		YM	Y distance to the center of mass measured from the reference point

Story Data (continued)

c. Third Card (4F10.0) Structural Lateral Load Condition A
See Figure 14.

Column	Note	Variable	Entry
1-10	(7)	FXA	X load for lateral load condition A
11-20		FYA	Y load for lateral load condition A
21-30		XA	X ordinate of the point of load application for load condition A
31-40		YA	Y ordinate of the point of load application for load condition A

d. Fourth Card (4F10.0) Structural Lateral Load Condition B
See Figure 14

Column	Note	Variable	Entry
1-10	(7)	FXB	X load for lateral load condition B
11-20		FYB	Y load for lateral load condition B
21-30		XB	X ordinate of the point of load application for load condition B
31-40		YB	Y ordinate of the point of load application for load condition B

NOTES/

1. This entry must be less than or equal to NPAT (Section 2.b.). If this entry is nonzero, data on Card 2 below are ignored.

2. This defines the level of the horizontal rigid diaphragm of this story. Story lateral loads are assumed to be generated at this level. Frame levels must correspond to structural levels defined in the story data. A zero story height will set the story level of the diaphragm at the same elevation as that of the following diaphragm (below).

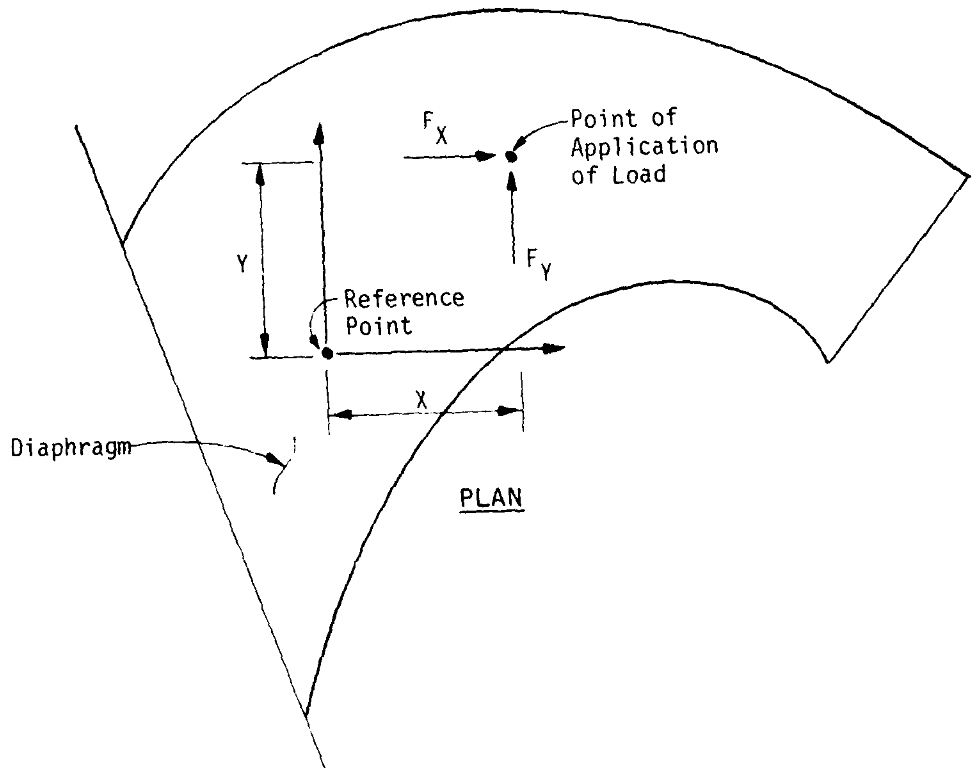


Figure 14. Static lateral load conditions A and B

3. These are extra story stiffnesses acting on lines through the center of mass of the story and can be used to represent restraints (or braces) at the story level or can be used to represent soil stiffness in levels below the ground.

4. The translational mass has units of force divided by acceleration (W/g). The rotational mass moment of inertia is not required if the allowable story degrees of freedom (NSD, Section 2.b.) do not include rotation. Mass properties need not be supplied if NAT equals 0.

5. Expressions for evaluating the mass moment of inertia of various diaphragm configurations are presented in Figure 15.

6. The center of mass is related to the following aspects of the solution process:

   a. The dynamic lateral forces and torsional moments of the diaphragm are generated at this point.

   b. The external story stiffnesses, if any, are assumed to be at this point.

   c. The story static structural displacements, (lateral displacements and rotations) are printed at this point.

   For a dynamic analysis the location of the center of mass must be defined.

   In a static analysis no entries need necessarily be made for the center of mass coordinates. In such a case the story static displacements will be printed at the reference point.

   The location of the point of action of the static lateral loads is not defined by the coordinates of the center of mass.

7. The Third and Fourth cards define the lateral loads acting on the horizontal rigid diaphragm for the two lateral load conditions A and B. The story load is applied at a point on the diaphragm in the form of X and Y components. The load data on these cards is superceded if NUBC is 1.

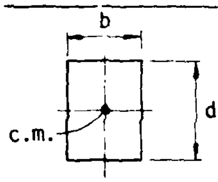
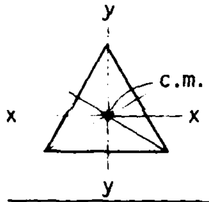
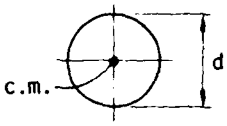
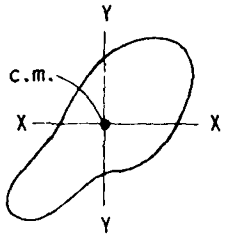
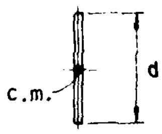
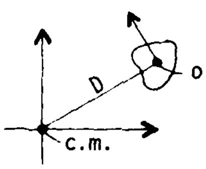
Shape in plan	Mass Moment of Inertia about vertical axis (normal to paper) through center of mass	Formula
	Rectangular diaphragm Uniformly distributed mass per unit area Total mass of diaphragm = $M(=\frac{W}{g})$	$MMI_{cm} = \frac{M}{12}(b^2+d^2)$
	Triangular diaphragm Uniformly distributed mass per unit area Total mass of diaphragm = $M(=\frac{W}{g})$	Use general diaphragm formula
	Circular diaphragm Uniformly distributed mass per unit area Total mass of diaphragm = $M(=\frac{W}{g})$	$MMI_{cm} = \frac{Md^2}{8}$
	General diaphragm Uniformly distributed mass per unit area Total mass of diaphragm = $M(=\frac{W}{g})$ Area of diaphragm = A Moment of inertia of area about XX = I_X Moment of inertia of area about YY = I_Y	$MMI_{cm} = \frac{M}{A}(I_X+I_Y)$
	Line mass Uniformly distributed mass per unit length Total mass of line = $M(=\frac{W}{g})$	$MMI_{cm} = \frac{Md^2}{12}$
	Axis transformation for a mass M If mass is a point mass $MMI_o = 0$	$MMI_{cm} = MMI_o + MD^2$

Figure 15. Formulae for mass moment of inertia

5. FRAME DATA

Prepare one set of data for each different frame. Data for frames with different locations but with identical properties and vertical loadings are entered only once. See Figure 3.

a. Frame Control Cards

Card 1 (14A5)

Column	Note	Variable	Entry
1-70		FHED	Label information to be used to identify this frame type

Card 2 (10I5)

Column	Note	Variable	Entry
1-5	(1)	M	Frame identification number
6-10	(2)	NC	Number of vertical column lines in this frame
11-15	(3)	NS	Number of story levels (diaphragms) in frame
16-20	(4)	NCP	Number of sets of different column/ panel/diagonal properties
21-25	(5)	NBP	Number of sets of different beam (girder) properties
26-30	(6)	NFEF	Number of sets of different beam span vertical loading patterns
31-35	(7)	MCONL	Maximum number of concentrated loads in any one beam span load pattern of this frame
36-40	(8)	NPAN	Number of infill shear panels in this frame
41-45	(9)	NDIG	Number of diagonals in this frame
50	(10)	IPLT	Frame plot flag EQ.0; Do not plot frame elevation EQ.1; Plot frame elevation EQ.2; Plot frame elevation with element type and vertical loading identification

Frame Control Card (continued)

Column	Note	Variable	Entry
55	(11)	NSCC	Story connectivity code EQ.0; Normal connectivity EQ.1; Special connectivity

NOTES/

1. Frame identification numbers must be entered in an ascending consecutive numerical sequence, beginning with number one. This frame may be located (repeated) at different positions in the structure via the frame location cards. See Section 6 below.

2. An isolated shear wall may be modeled as a single column line frame. In this case all data pertaining to the beams are meaningless and must be omitted in the data input sections below. Note that the number of bays in a frame is always one less than the number of column lines.

   Panels and bracing elements need at least two column lines for definition. Therefore, a single column line frame can have no panels or braces.

   Application of vertical loads (except column self weight) is only possible via beam span loads. Definition of a beam requires two column lines. Therefore, a single column line frame can have no superimposed vertical load applied.

3. The number of levels in the frame corresponds to the number of story diaphragms to which the frame is connected, the frame levels may connect sequencially (but not necessarily consecutively) to any story diaphragm (See Section 5.b. below).

4. This entry controls the number of cards to be read in Section 5.e. below. The column, panel, and diagonal elements are all axial/bending elements and this entry defines the number of different section properties that exist in the columns, panels, and/or diagonals of this frame. These properties are assignable to any or all of the columns, panels, or diagonals in the frame.

5. This entry controls the number of cards to be read in Section 5.f. below. This entry defines the number of different types of beam sections that exist in this frame. Beam properties may be referenced by any number of beams in the frame.

6. This entry controls the number of different beam span loadings on the various beams of this frame.

   If no vertical loads are applied to the structure or if this is a single column frame, enter zero for this number and skip Section 5.g. below.

7. This number is required to pre-allocate memory storage for the concentrated loads that may exist in the beam span loading patterns.

8. This entry controls the number of cards to be read in Section 5.h. (iii) below.

9. This entry controls the number of cards to be read in Section 5.h. (iv) below.

10. If IPLT equals 1, the plot file will contain a plot of an elevation of this frame, provided that the master plot control flag (Section 2.b.) is set at 2 or 3. If IPLT equals 2 the element property

identification numbers along with the beam span loading identifications (for loading conditions I through IV) will be plotted on the elevation of the frame.

11. If NSCC equals 0 the program assumes that the frame levels correspond to the lowest NS levels of the structure. If NSCC equals 1 the user must specify the structural levels to which the frame levels are connected by providing data in Section 5.b.

b. <u>Story Connectivity Data</u> (14I5)

Skip this section of input data if the story connectivity code (Section 5.a.) is 0. Otherwise provide one entry for each of the NS levels of this frame (from top to bottom) up to fourteen entries per card.

Column	Note	Variable	Entry
1-5	(1)	NSC	Structural level number connecting to the NS-th (top) level of this frame
....			....
66-70			Structural level number connecting to the (NS-13)th level of this frame

NOTES/

1. The structural level numbers are NST (Section 2.b.) for the top level of the structure and 1 for the lowest level of the structure. All the entries in this data section must be greater than or equal to 1 and less than or equal to NST. Also the entries must be in a decreasing numerical sequence, though not necessarily consecutive.

In other words, the structural level number that the NS-th frame level connects to must be greater than the structural level number connecting to the (NS-1)th frame level, and so on.

The story connectivity data allows arbitrary frame/structure assembly. With this data option it is not necessary for a frame to connect to all diaphragms of the structure that intercept it. For example consider an eight story structure with 12-foot story heights (96 feet tall). It is possible to model a wall which connects only to top level (level 8) and the ground, by-passing all other levels. Such a wall will be a one story wall with story connectivity data for the one level of the wall being 8.

The frame level heights are automatically established based upon the story heights of the by-passed structural levels.

This option makes it possible to model structures having more than one independent diaphragm at any one level, structures with partial diaphragms and buildings having supports at different elevations.

Frame Data (continued)

c. Bay Width Data (7F10.0)

Skip this section of the input if the number of column lines in this frame is one (Section 5.a.). Otherwise provide seven entries per card.

Column	Note	Variable	Entry
1-10	(1)	BW	Bay width between column lines 1 and 2
.....			....
61-70			Bay width between column lines 7 and 8

d. Sill Height Data (7F10.0)

Skip this section of input if the number of column lines in this frame is one (Section 5.a.). Otherwise provide seven entries per card.

Column	Note	Variable	Entry
1-10	(2)	SL	Sill height between columns 1 and 2
.....			....
61-70			Sill height between columns 7 and 8

NOTES/

1. The bay width is the center-to-center distance between adjacent column lines; see Figure 3 . Bay widths are input from left to right as one views the frame in elevation. The column line numbers increase in the positive "ℓ" direction, where "ℓ" is directed from the viewer's left to his right. Input as many cards in this section as are required to define all bays in this frame, at seven bay widths per card. The number of bays is always one less than the number of column lines in the frame.

2. The sill depths are merely used to reduce the effective column heights, due to sills that may exist at the foundation level in the frame (See Figure 3). The sill heights may exist in every bay. The number of sill height entries is the same as the number of bay widths and must be entered similarly from left to right along the positive "ℓ" direction of the frame.

Frame Data (continued)

e. <u>Column/Panel/Diagonal Property Cards</u> (I5,F5.0,6F10.0)

Provide one card in this section for each different column/panel/diagonal section properties in this frame. The same property may be referenced by different element types or elements.

Column	Notes	Variable	Entry
1-5	(1)	M	Identification number for this property set
6-10	(2)	U	Unit weight (Not for story mass calculation)
11-20		E	Modulus of elasticity
21-30		A	Axial cross-sectional area
31-40	(3)	XI	Moment of inertia
41-50	(4)	AV	Effective shear area
51-60	(5)	W	Column width
61-70	(6)	T	Column thickness

NOTES/

1. Property set identification numbers must be in ascending consecutive numerical sequence beginning with one.

   A (-) sign in column 1 will indicate that this section is a rectangular section. In this case entries for A, XI, and AV are not needed. The program will calculate these properties from the entries for W and T as follows:

   A = W * T

   XI = W * W * W * T/12.

   AV = A * 5./6.

2. U is the unit weight of the element material in force/unit volume units (e.g., 150 pounds/cu ft* for concrete). This is used to calculate the weight of the element. The weight is lumped into vertical load condition I at the top ends of the corresponding elements. The weight is based upon the clear heights for columns, the story-to-story heights for panels and the full lengths for diagonals. For the purpose of determining the element volume for weight calculation the axial area (not the shear area) is used.

3. Columns, panels and diagonals must be prismatic from story level to story level.

4. A shear area of pure zero (blank) will cause the program to exclude the effect of shear deformations. In other words, the shear deformations will be assumed to be zero. Effectively a pure zero shear area is defaulted to an infinite shear area by the program. The shear modulus is calculated from the elastic modulus assuming a Poisson's ratio of 0.2. See Figure 16.

5. The column width is used to reduce the effective length of the beams connecting to the column. See the theoretical manual, Chapter II Section A(iii)[18]. For single column line frames, this use of the column width is not applicable, as there are no beams. The column width is also used in the automatic rectangular section property calculation option.

6. This entry is only used if there is a (-) sign in column 1 to activate the automatic rectangular section property calculation.

---

* A table of factors for converting inch-pound units of measurement to metric (SI) units is presented on page 3.

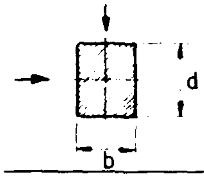
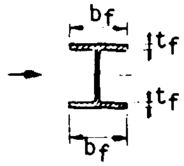
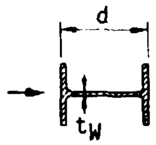
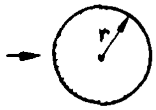
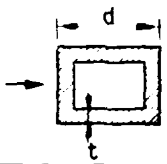
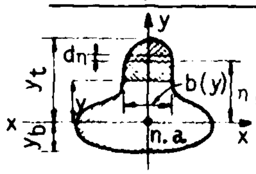
Section	Description	Equivalent Shear Area
	Rectangular Section Shear forces parallel to the b or d directions	$\frac{5}{6}\, bd$
	Wide Flange Section Shear forces parallel to the flange	$\frac{5}{3}\, t_f b_f$
	Wide Flange Section Shear forces parallel to web	$\doteq t_w d$
	Thin Walled Circular Tube Section Shear forces from any direction	$\frac{\pi r t}{2}$
	Solid Circular Section Shear forces from any direction	$0.9 \pi r^2$
	Thin Walled Rectangular Tube Section Shear forces parallel to d direction	2td
	General Section Shear forces parallel to Y-direction I_x = moment of inertia of section about x-x $Q(y) = \int_{y}^{y_t} \eta \, b(\eta) d\eta$	$\frac{I_x^2}{\int_{y_b}^{y_t} \frac{Q^2(y)}{b_y} dy}$

Figure 16. Formulae for calculating shear areas

Frame Data (continued)

f. Beam Property Cards (I5,F5.0,2F10.0,2F5.0,3F10.0)

Provide one card in this section for each different beam in the frame; skip this input if the frame has only one column line or if NBP equals 0, (Section 5.a.). See Figure 17.

Column	Note	Variable	Entry
1-5	(1)	M	Identification number for this beam property
6-10	(2)	U	Unit of weight (Not for story mass calculation)
11-20		E	Modulus of elasticity
21-30	(3)	XI	Reference moment of inertia
31-35		AK	Stiffness factor 4.0
36-40		AC	Carry-over factor
41-50	(4)	DB	Beam depth, below diaphragm level
51-60		DA	Beam depth, above diaphragm level
61-70	(5)	AV or T	Beam shear area or thickness

NOTES/

1. Property set identification numbers must be input in ascending consecutive numerical sequence beginning with one.

   A (-) sign in column 1 will indicate that this section is a rectangular section. In this case an entry for XI is not needed. The program will interpret the entry in columns 61-70 as the beam thickness, T, and not the beam shear area, AV. The values of AV and XI will be calculated by the program as follows:

   XI = D * D * D * T/12, where, D = DA + DB

   AV = D * T * 5./6.

2. U is the unit weight of the material in force/unit volume. This is used to calculate the self weight of the beam, in weight/unit length as follows: Weight/unit length = AV * U. This weight is added to the uniform weight of load condition I for this beam. It should be noted that the weight is based upon the shear area, and if the shear area is not equal to the actual area of the cross section of the beam, a compensating correction should be made to the input value of U.

3. Beams need not be prismatic but must be symmetrical.

   For prismatic sections:

   XI is the moment of inertia of the section,

   AK = 4.0, AC = 0.5

   For non-prismatic sections:

   XI is the reference moment of inertia for AK and AC

   See Figure 17.

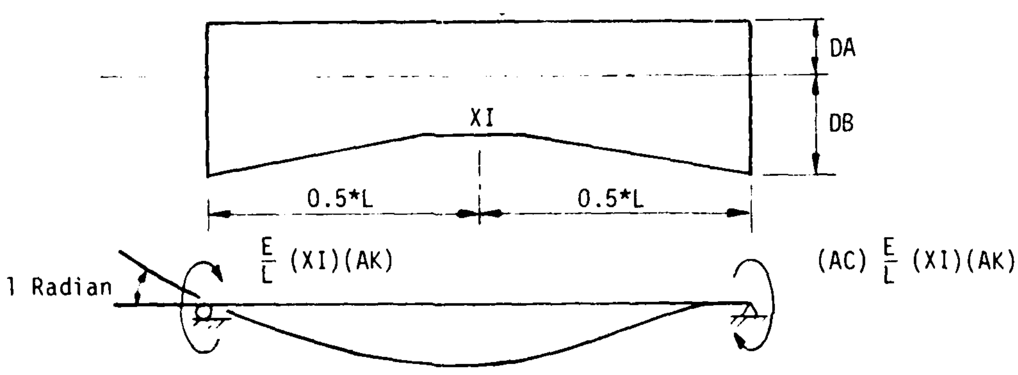


Figure 17. Beam properties

4. The beam depth below diaphragm, DB, is used to shorten the effective lengths of the columns below the beam.

   The beam depth above the diaphragm, DA, is used to shorten the effective length of the column above the beam.

   DA and DB are also used in the automatic beam rectangular section property calculation.

5. This entry is the beam shear area if there is no (-) sign in column 1. If a negative sign exists in column 1, this entry is interpreted as the beam thickness as described in note 1 above. Also see Section 5.e. note 4.

Frame Data (continued)

g. Beam Span Loading Data

Prepare one set of data for each different type of vertical beam loading; omit these data if this is a single column line frame or if NFEF equals 0, (Section 5.a.). See Figure 18.

(i) First Card (2I5,4F10.0)

Column	Note	Variable	Entry
1-5	(1)	M	Identification number for this vertical loading set
6-10	(2)	NCON	Number of concentrated loads for this set
11-20	(3)	XML	Left fixed-end moment
21-30		VL	Left fixed-end shear
31-40		XMR	Right fixed-end moment
41-50		VR	Right fixed-end shear

(ii) Second Card (3F10.0)

Column	Note	Variable	Entry
1-10	(4)	WW	Uniform force per unit length acting downward to be added to fixed-end forces
11-20	(5)	FL	Point load, acting downwards on left column center line
21-30		FR	Point load, acting downwards on right column center line

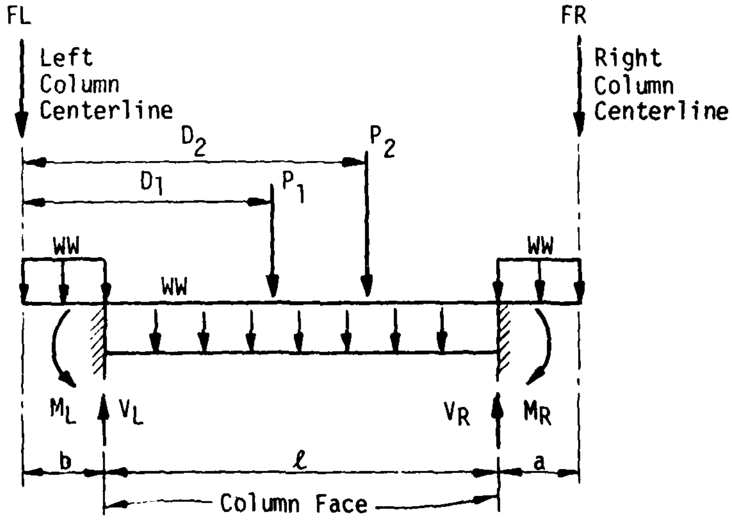


Figure 18. Beam span loading

Frame Data (continued)

(iii) Concentrated Load Cards (6F10.0)

Skip these cards if the number of concentrated loads is 0 otherwise provide NCON pairs of values. Three pairs per card. Start with the load at the extreme left and move right.

Column	Note	Variable	Entry
1-10	(6)	D1	Distance of load 1 from left-hand column center line
11-20		P1	Magnitude of load 1
21-30		D2	Distance of load 2 from left-hand column center line
31-40		P2	Magnitude of load 2
.....		..	......

Skip to next card if number of concentrated loads is greater than 3 and so on.

NOTES/

1. Load Set Identification Numbers must increase in consecutive numerical sequence starting with 1.

2. NCON should be less than or equal to MCONL (Section 5.a.). NCON controls the number of concentrated load entries to be made on the concentrated load cards below.

3. These forces, XML, VL, XMR, and VR, must be calculated at the outer faces of the columns below the beam, because that is where the final member forces for the beam will be output. The input (+) sign convention is shown in Figure 18 . In most practical situations these forces need not be calculated as the loading can

be defined by the uniform load and concentrated load options below, where the fixed-end moments are automatically calculated internally. Also by defining the loading via the uniform load and concentrated load options the user provides the span load distribution which enables the program to calculate a correct span moment (moment at the first point of zero shear, from the left column), which otherwise will not be available in a correct form.

4. This is the superimposed uniform load. The beam self weight is added to this load internally, if this load set is defining load condition I for the beam. The internal calculation of the fixed end forces is exact only for prismatic beams. The uniform load over the column widths below, is lumped at the column center lines.

5. Loads occurring from any out-of-plane framing may be applied onto the frame via this option.

6. Positive loads act downwards. The distances D1, D2, . . . which define the points of load application will be interpreted as a ratio of the total bay width if D1, D2, . . . are less than 0, (negative) and as actual distances measured from the left column center line if D1, D2, . . . are greater than 0. Therefore, on a bay width of 12 feet, a concentrated load of 2^k at midspan may be input as either (D1 = 6.0 and P1 = 2.) or

   (D1 = -0.5 and P1 = 2.)

   D1, D2, . . must be in increasing (absolute) numerical sequence. The fixed-end forces calculated are exact only for prismatic beams neglecting the effects of shear deformations.

Frame Data (continued)

h. Member Location Data

(i) Column Cards (2I5)

Provide one card per column from top to bottom and from left to right of the frame (unless the data generation option is used).

Column	Note	Variable	Entry
1-5	(1)	LC	Column/Panel/Diagonal property set identification number
6-10	(2)	K	Number of columns in sequence below to be generated having the same properties

Skip the following data sections (ii), (iii), and (iv) if this is a single column line frame.

(ii) Beam Cards (2I5)

Provide one card per bay from top to bottom and from left to right in the frame (unless the data generation option is used).

Column	Note	Variable	Entry
1-5	(3)	LB	Beam property set identification number for this girder
6-10	(4)	K	Number of beams in sequence below to be generated having the same properties

(iii) Panel Cards (5I5)

Skip this data section if the number of panels in this frame is zero; otherwise enter one card per panel in any order unless generation is used.

Column	Note	Variable	Entry
1-5	(5)	LP	Level identification number at the top of this panel

Frame Data (continued)

Column	Note	Variable	Entry
6-10			Bay number in which panel starts
11-15			Bay number in which panel ends
16-20	(1)	PP	Column/Panel/Diagonal set identification number, defining properties of the panel
21-25		K	Number of panels to be generated below having the same properties and location in lower levels

(iv) Diagonal Cards (5I5)

Skip this data section if the number of diagonals in this frame is zero; otherwise enter one card per diagonal in any order unless generation is used.

Column	Note	Variable	Entry
1-5	(5)	LDIG	Level identification number at the top of this panel
6-10			Column line number at the lower end of this diagonal
11-15			Column line number at the upper end of this diagonal
16-20	(1)	PDIG	Column/Panel/Diagonal property set identification number, defining properties of diagonal
21-25		K	Number of diagonals to be generated below having the same properties and location in lower levels

NOTES/

1. This number references the column/panel/diagonal property data table defined in Section 5.e. above. Missing columns are input as having a property set identification number 0.

2. Generation is allowed only within the current column line; every new column line must start with a new card.

3. This number references the beam property data table defined in Section 5.f. above. Missing beams are input as having a beam property set identification number 0.

4. Generation is allowed only within the current bay; every new bay must start with a new card.

5. The foundation line is defined as level number zero, and the roof level number is equal to the total number of stories in the building.

Frame Data (continued)

i. Vertical Loading Data (5I5)

Provide one card per girder from top to bottom and from left to right for every girder in the frame (unless the data generation option is used). This data section must be omitted entirely for single column line frames, or if NFEF (Section 5.a.) is zero.

Column	Note	Variable	Entry
1-5	(1)	LDB	Beam span loading set identification number for vertical load condition I
6-10			Beam span loading set identification number for vertical load condition II
11-15			Beam span loading set identification number for vertical load condition III
16-20			Beam span loading set identification number for vertical load condition IV
21-25	(2)	K	Number of beams in sequence below having the same vertical loading as this beam

NOTES/

1. This number references the beam span loading sets previously defined in Section 5.g. If any beam has no superimposed loading for any load condition the corresponding beam span loading number may be input as 0. The self weight of the beam in load condition I is also ignored if the entry in columns 1-5 above is zero. Loadings applied on beams having a beam property identification (Section 5.a. (ii) above) of zero are ignored.

2. Generation is allowed only within the current bay; every new bay must start with a new card.

6. <u>FRAME LOCATION CARDS</u> (2I5,4F10.0,4A5)

Provide one card in this section for each frame in the building; the total number of frame location cards must equal NTF, (Section 2.b.). See Figure 19.

Column	Note	Variable	Entry
1-5	(1)	M	Frame identification number
6-10		IFC	Force calculation code: EQ.0; Frame forces will be calculated EQ.1; Frame forces will not be calculated
11-20	(2)	X1	Distance, X1
21-30		Y1	Distance, Y1
31-40		X2	Distance, X2
41-50		Y2	Distance, Y2
51-70			Information to be printed with the output to identify this particular frame.

NOTES/

1. This entry refers to the frame identification number (Section 5.a.) of the frame being placed via this frame location card. Frame identification numbers may be repeated, but the location cards must be input such that the frame identification numbers are in an ascending numerical sequence starting with one.

2. The frame location is established by providing the coordinates of two points, (X1, Y1) and (X2, Y2) along the line defining the direction of the frame. The local axis of the frame is then defined by the vector directed from point 1 toward point 2. If the plan of the structure is to be plotted these points must be located such that they define a line which represents a plan view of the frame in length (and, of course, in direction).

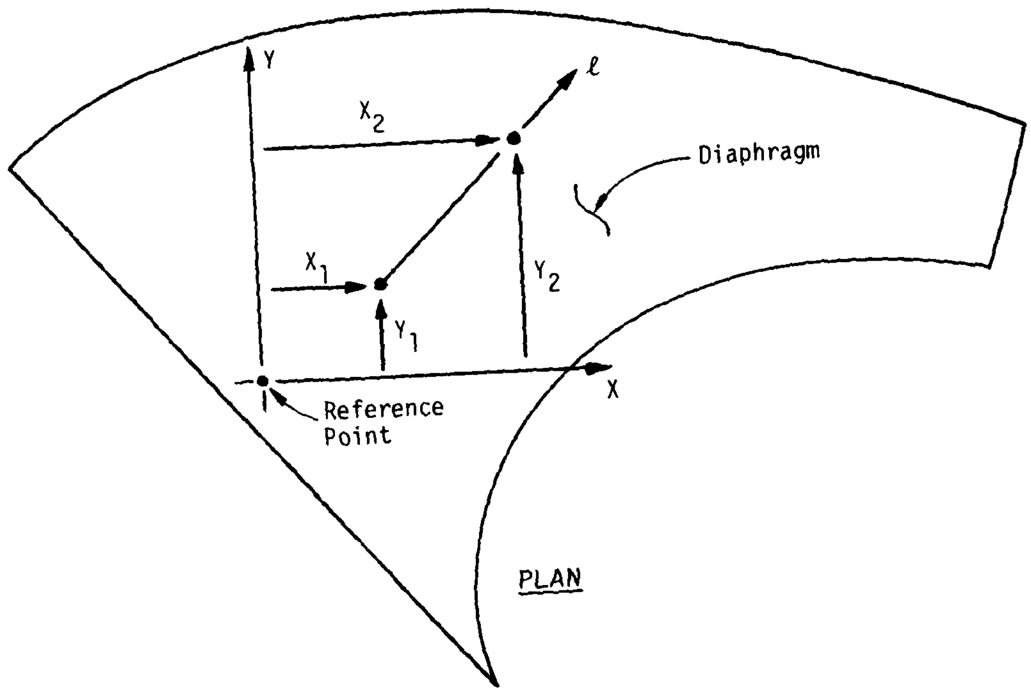


Figure 19. Frame location coordinates

7. DATA FOR CALCULATING LATERAL SEISMIC LOADS BASED ON UNIFORM BUILDING CODE 1979 (SEAOC CODE)

Skip this section if NUBC equals 0, (Section 2.b.); otherwise, provide three cards as follows:

a. First Card (4F10.0)

Column	Note	Variable	Entry
1-10	(1)	Z	UBC zone factor, Z (default = 1.0)
11-20	(1,3)	TS	Predominant period of the soil in seconds
21-30	(1)	UBCI	UBC importance factor, I (default = 1.0)
31-40	(2)	GRAV	Acceleration due to gravity EQ.0; set to 32.2 ft/sec^2

b. Second Card (2I5,2F10.0)

Data associated with X direction loads or load condition A. Y direction loads in condition A are set to 0. See Note 6 below.

Column	Note	Variable	Entry
1-5	(4)	NTOPX	Level number at top of UBC triangular distribution in X-direction LE.0; set to NST
6-10	(4)	NBOTX	Level number at bottom of UBC triangular distribution in X direction LE.0; set to 0
11-20	(5)	TX	Time period of predominant X mode LE.0; set by program, if NAT is not 0
21-30	(1)	KX	UBC structural type factor, K for X direction

Data for Calculating Lateral Seismic Loads (continued)

c. Third Card (2I5,2F10.0)

Data associated with Y direction loads or load condition B. X direction loads in condition B are set to 0. See Note 6 below.

Column	Note	Variable	Entry
1-5	(4)	NTOPY	Level number at top of UBC triangular distribution in Y direction LE.0; set to NST
6-10	(4)	NBOTY	Level number at bottom of UBC triangular distribution in Y direction LE.0; set to 0
11-20	(5)	TY	Time period of predominant Y mode LE.0; set by program, if NAT is not zero
21-30	(1)	KY	UBC structural type factor, K for Y direction

NOTES/

1. Details of the seismic load calculation method and the definitions of the various factors are presented in Chapter 23 of Reference 14.

2. The gravitational acceleration is used for converting the story masses defined in Section 4 into weights for use in calculating the UBC seismic loads.

3. TS is required for calculating the UBC soil factor, S. If TS is not input S is assumed to be 1.5.

4. It is possible for the structural model to have levels for penthouses, basements or dummy storys for special modeling. Such levels should not be part of the overall structural triangular lateral force distribution as defined by the UBC. The variables NTOPX

and NBOTX (or NTOPY and NBOTY) define the extent of the triangular distribution pattern. See Figure 20.

5. If this entry is not provided, and NAT is not 0, the program will set this period equal to that of the mode having the largest participation factor in the X direction for TX (Y direction for TY).

6. The UBC loads generated replace any lateral loads provided in Section 4.c. and 4.d. above. However, the coordinates of the points of application of the loads are not changed by this option.

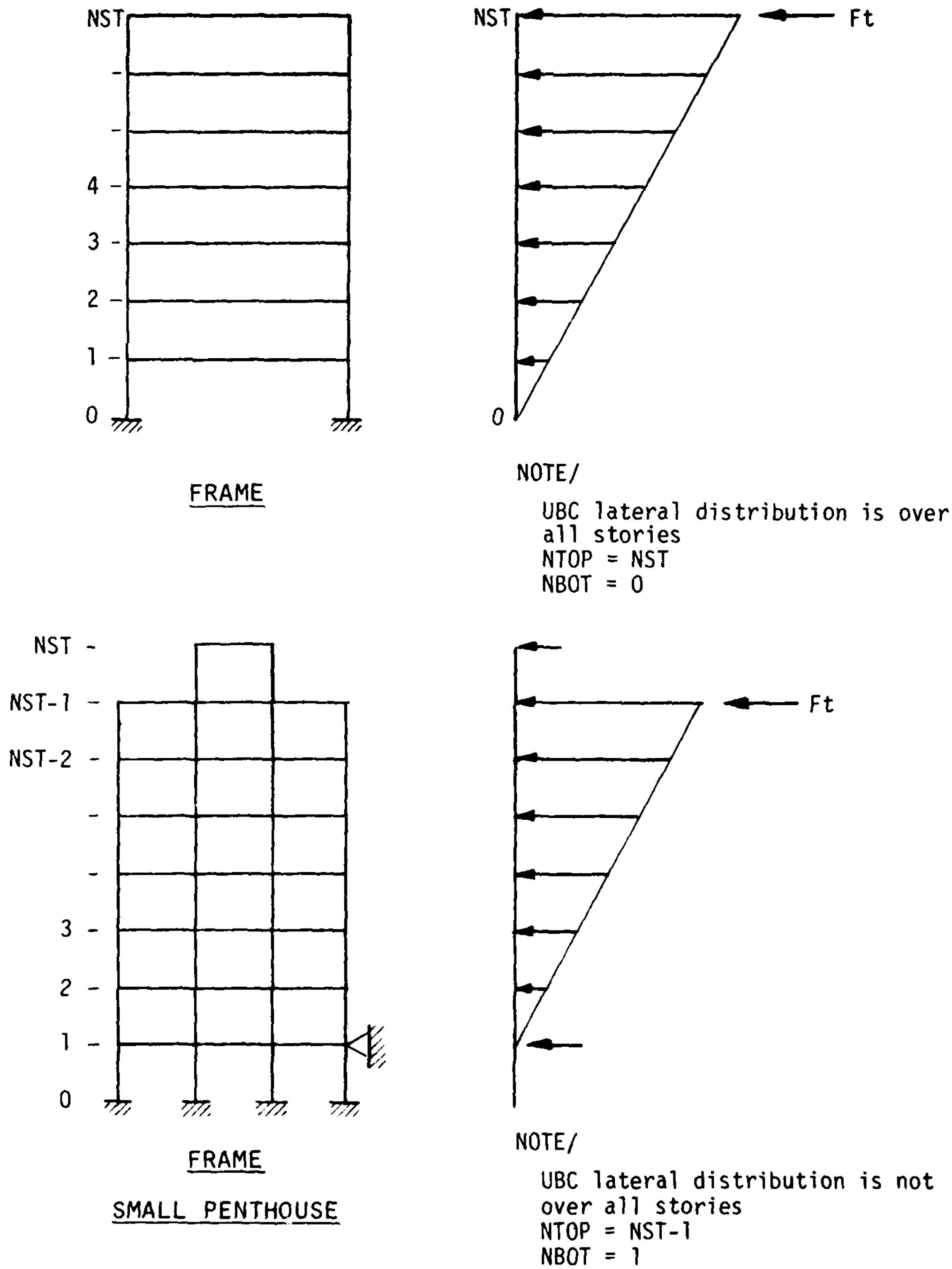


Figure 20. UBC lateral force distribution convention

8. EARTHQUAKE ACCELERATION SPECTRUM CARDS

These data cards are required only if NAT equals 3 (Section 2.b.).

a. Control Card (I5,5X,2F10.0,6A5)

Column	Note	Variable	Entry
1-5	(1)	NPER	Number of period cards used to define the acceleration spectrum
6-10	(2)	NMD	Number of modes to be printed separately
11-20	(3)	SF	Scale factor for accelerations
21-30	(4)	FI	Direction of earthquake input (degrees). See Figure 2
31-40	(5)	SDAMP	Damping ratio of response spectrum
41-70		SHED	User information to be printed with output

b. Period Cards (2F10.0)

Provide NPER cards to define spectrum curve.

Column	Note	Variable	Entry
1-10	(6)	PA	Period entered in increasing numerical sequence
11-20			Spectrum acceleration

NOTES/

1. At least two cards must be provided.

2. If the responses in each mode are required to be printed separately the output will consist of NMD extra load cases; thus the total number of load cases printed will become (NLD + NMD) where NLD is defined in Section 2.b. The last NMD load cases are associated with the NMD modes requested separately. NMD must be less than or equal to NFQ defined in Section 2.b.

3. This is just a multiplying factor to scale the spectrum acceleration value input below, to amplify or reduce the spectrum intensity or to transform the acceleration into consistent units.

4. The direction angle is measured positively clockwise from the global Y direction.

5. The damping ratio is required for use in the CQC combination technique as outlined in the theoretical manual Chapter IV, Section E[18].

6. If the period of the mode being considered is out of the range covered by the period range of the spectrum curve the spectral value for the mode will be set equal to that associated with the closest time period on the period cards that are provided.

9. TIME HISTORY CARDS

These data cards are required only if NAT equals 4. (See Section 2.b.)

a. Heading and Format Card (10A3,10A4)

Column	Note	Variable	Entry
1-30		SHED	User information to be printed with output
31-40	(1)	SFMT	Time history format If blank default format is assumed as: (2F10.0) if IHTYP equals U, see below (8F9.0) if IHTYP equals E, see below

b. Control Card (2I5,3F10.0,9X,A1,F10.0)

Column	Note	Variable	Entry
1-5	(2)	NPC	Number of acceleration cards
6-10	(2)	NTIME	Number of sampling values
11-20	(3)	SF	Scale factor for accelerations
21-30	(4)	FI	Direction of earthquake input, (degrees) See Figure 2
31-40	(5,2)	DT	Time increment for sampling
50	(6)	IHTYP	Time history type EQ.U; Variable time interval; pairs are input for each point in the history EQ.E; Constant time interval; time spacing HDT input once and h(t) input (only) for each point in the history
51-60	(6)	HDT	Time interval spacing for IHTYP equals E type history must be greater than zero

c. Damping Cards (I5,F10.0)

One card must be supplied for each of the NFQ modes (See Section 2.b.)

Column	Note	Variable	Entry
1-5		N	Mode number (in ascending order)
6-15	(7)	DAMP	Damping ratio: Modal Damping/Critical Damping

Time History (continued)

d. Acceleration Data Cards

The acceleration data depends upon the type of time history (U or E).

(i) If IHTYP equals U (using default format)

Provide one card for each time point on the history

Column	Note	Variable	Entry
1-10	(6)	PA(1,1)	Time at point 1
11-20		PA(2,1)	Acceleration value at point 1

(ii) If IHTYP equals E (using default format)

Provide as many cards needed to define the history at eight points per card.

Column	Note	Variable	Entry
1-9	(6)	PA(2,1)	History value at time 0*HDT
10-18		PA(2,2)	History value at time 1*HDT
19-27		PA(2,3)	History value at time 2*HDT
...		...	...
64-72		PA(2,8)	History value at time 7*HDT

NOTES/

1. SFMT is used as a variable format by the program. As such, it must be enclosed in parentheses and conform to the rules of FORTRAN; for example:

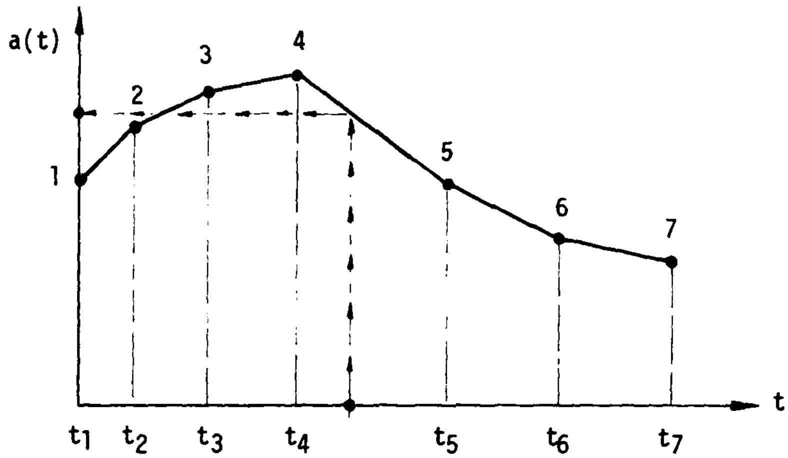
   (8F10.0)

   (12F6.0)

   (6E12.3)

   The program does not decode the format and therefore cannot detect an illegal format; illegal formats will cause the program to abort.

2. This history is input as a table of NPC points. Suppose, for example, the history appears as follows:



In this case, NPC is 7. The value of the acceleration at any time between two successive input time ordinates (t_4 and t_5, say) is calculated by linear interpolation. NPC must be greater than 1. By convention, the first acceleration value must be associated with a time equal to 0. Time must always <u>increase</u> from time step to time step. Constant time over two consecutive time steps is an error condition. The time span covered by the NPC specifications must be greater than NTIME * DT

3. This is just a multiplying factor to scale the time history acceleration values provided below to amplify or reduce the acceleration intensity or to transform the acceleration into consistent units.

4. The direction angle is measured positively clockwise from the global Y direction.

5. The time span over which the time history analysis is carried out is given by NTIME * DT. Member forces and displacements are calculated after every DT seconds, ending up with NTIME values for each output component. The maximum of the NTIME values for each component is what is printed. Since explicit integration is used in computing the response, numerical instability problems are never encountered and the time increment may be any desired sampling value that is deemed fine enough to capture the maximum response values. One-tenth of the time period of the highest mode is usually a good recommended value; however, a larger value may give just as accurate a sampling if the contribution of the higher modes is small.

6. IHTYP defines the method that the program is to use in reading the time history input. If IHTYP is "U", the program expects to read pairs of time and associated history value according to the format SFMT; with this method of input HDT is ignored by the program.

   If, IHTYP is "E", the program will read history values (only) at equal intervals along the t-axis, using the input format SFMT; HDT is the t axis spacing for history value input.

7. The damping is represented as a fraction of the critical damping; therefore, it must be less than 1.0.

10. LOAD CASE DEFINITION CARDS (2I5,9F5.0,2A6)

Load cases for the complete building are defined as a linear combination of the vertical loading conditions (I through IV), the lateral loading conditions (A and B), and the earthquake spectrum and time-history loading conditions. *One card must be entered in this section for each different* structural load case; the total number of building load cases is controlled by NLD (Section 2.b.). These data cards should not be supplied if NAT equals 1 (Section 2.b.).

Column	Note	Variable	Entry
1-5		M	Load case number
6-10		IXM	Absolute load condition code: EQ.1; The absolute values (signs ignored) of the forces and displacements from the load conditions are used in the formulation of a load case. Signs on the multipliers are not ignored EQ.0; No signs are ignored
11-15	(1)	XM	*Multiplier for vertical load condition I*
16-20			Multiplier for vertical load condition II
21-25			Multiplier for vertical load condition III
26-30			Multiplier for vertical load condition IV
31-35			Multiplier for lateral load condition A
36-40			Multiplier for lateral load condition B
41-45			Multiplier for dynamic loading 1
46-50			Multiplier for dynamic loading 2
51-55			Multiplier for dynamic loading 3
56-67			Load case identification information

NOTES/

1. If NAT (Section 2.b.) equals 0 or 2 (i.e. static analysis), dynamic loadings 1, 2, and 3 are inactive, any multipliers entered in the columns associated with these loadings will have a null effect on the load case.

   If NAT equals 3 (i.e., static analysis with response spectrum analysis), all dynamic loading conditions are active as follows:

   Dynamic loading 1 : Response spectrum combination by SRSS

   Dynamic loading 2 : Response spectrum combination by ABS

   Dynamic loading 3 : Response spectrum combination by CQC

   If NAT equals 4 (i.e., static analysis with time-history analysis), only dynamic loading 3 is active and contain the response maxima from the time-history analysis.

11. LAST CARD

The last card in the input stream must be an end card to terminate execution.

Column	Note	Variable	Entry
1-3	(1)	ISTOP	The word "END"

NOTES/

1. If this card is not there the program will "bomb".

CHAPTER VII: EXAMPLES

The following are a set of data cases compiled to demonstrate the capabilities of the CTABS80 computer program.

In order to limit the volume of the material presented here, only representative samples of the complete output produced by the program are included.

A. Example 1

(i) Description

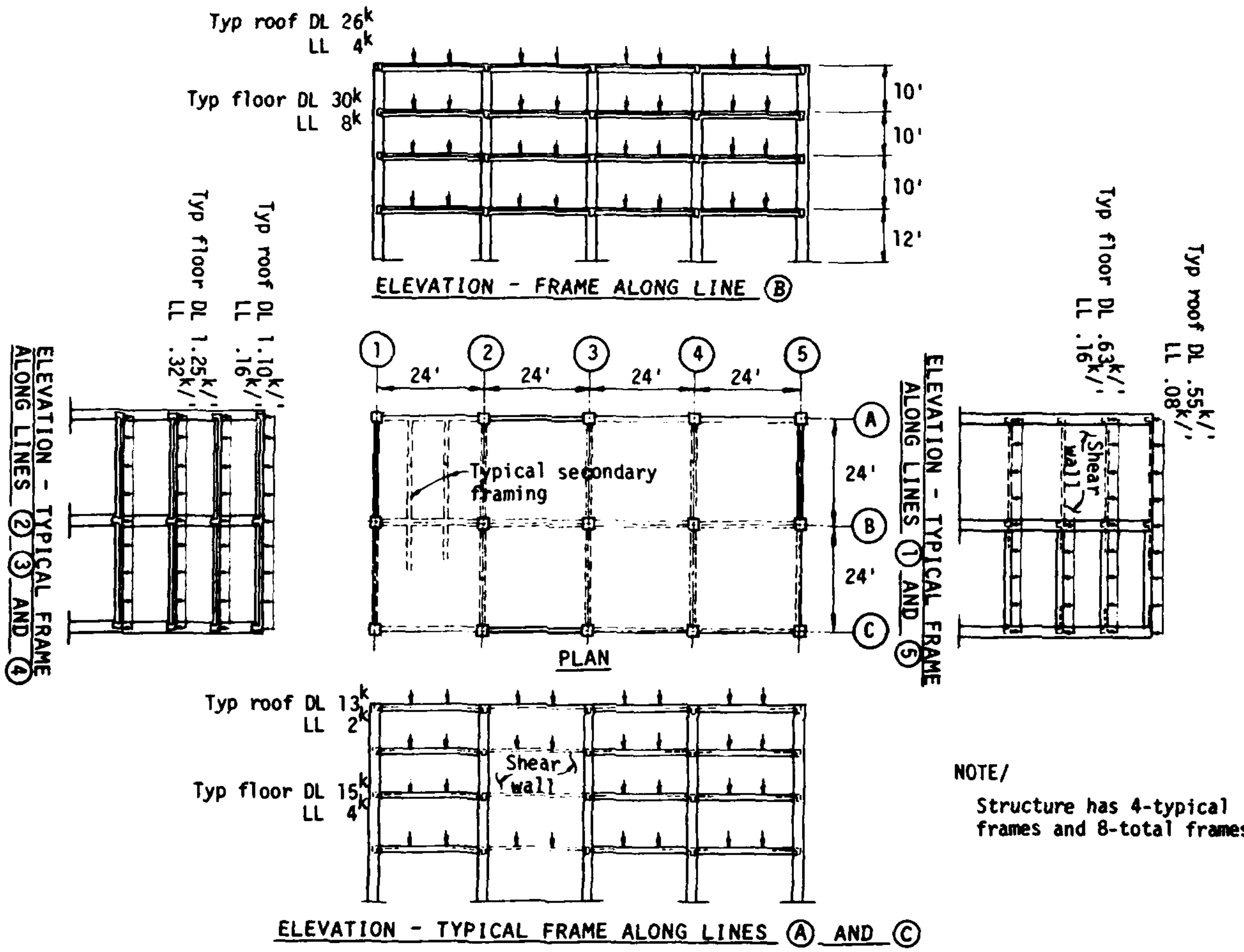
This is a four story structure consisting of a series of frame and shear walls. The structure is analyzed for dead and live loads and for lateral static seismic loads acting in the longitudinal and transverse directions of the structure. Time periods and mode shapes are evaluated.

(ii) Significant options of CTABS80 activated

1. Mass properties calculated automatically
2. Section properties calculated automatically
3. Automatic fixed-end force calculations
4. UBC lateral loads calculated automatically
5. Plotting
6. Static analysis, vertical and lateral
7. Stress output

(iii) Comments

The example demonstrates modeling of frames and shear walls with beam and column elements, shear walls being modeled as wide columns.



EXAMPLE 1

NOTE/

Structure has 4-typical frames and 8-total frames

Computers/Structures International
4009 Webster Street
OAKLAND, CALIFORNIA 94609
(415) 655-9151

JOB CTABS80 / Example 1
SHEET NO ____ OF ____
CALCULATED BY AH DATE 5/15/80
CHECKED BY ____ DATE ____
SCALE ____

Basic Loads

	psf vertical	psf lateral
Roof		
Roofing	6	6
Slab 8"	100	100
Ceiling/Mech	10	10
Beams	20	20
Columns	-	2
Walls	-	12
Partitions	-	10
Misc	2	2
DL	138	162
LL	20	-

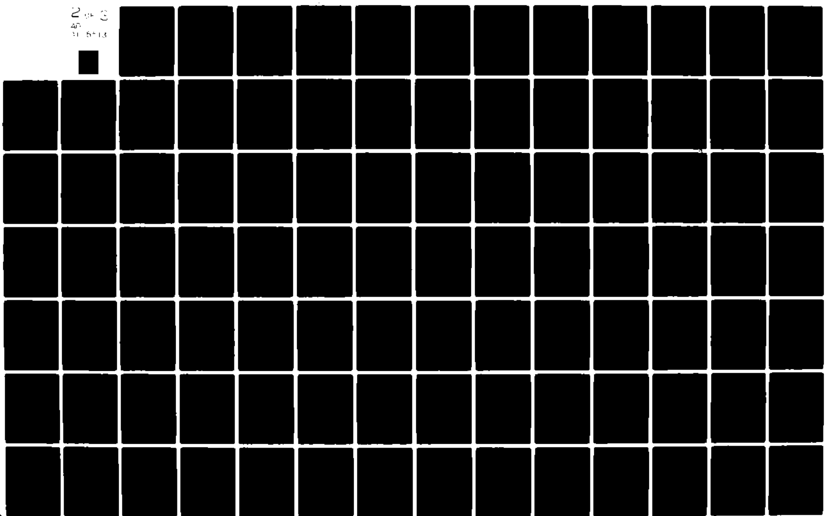
Roof weight, W_R
$= 48 \times 96 \times .162$
$= 746^k$

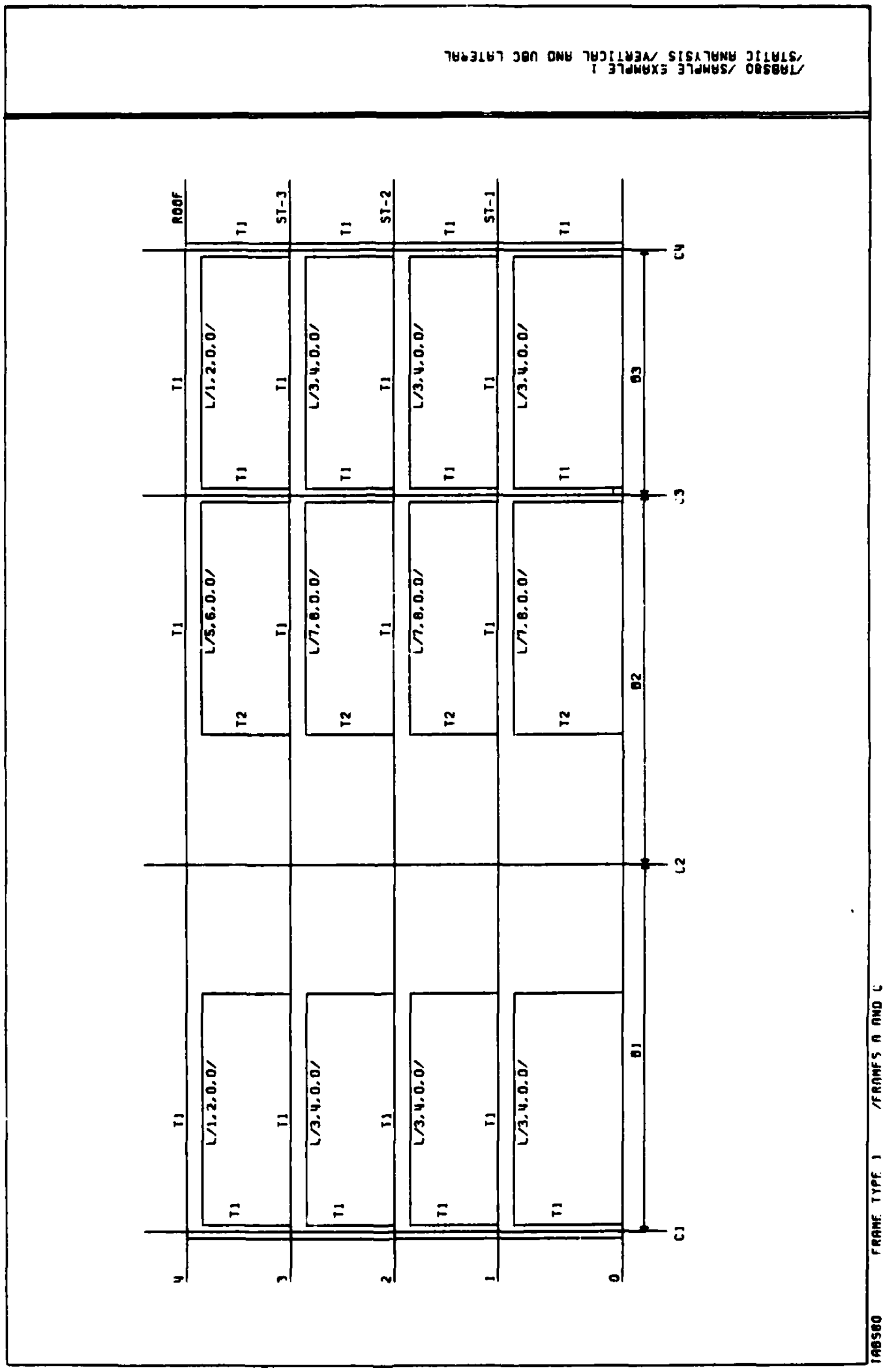
	psf vertical	psf lateral
Floor		
Flooring	2	2
Slab 8"	100	100
Ceiling/Mech	10	10
Beams	20	20
Columns	-	4
Walls	-	24
Partitions	20	20
Misc	2	2
DL	154	182
LL	40	-

Floor weight, W_F
$= 48 \times 96 \times .182$
$= 839^k$

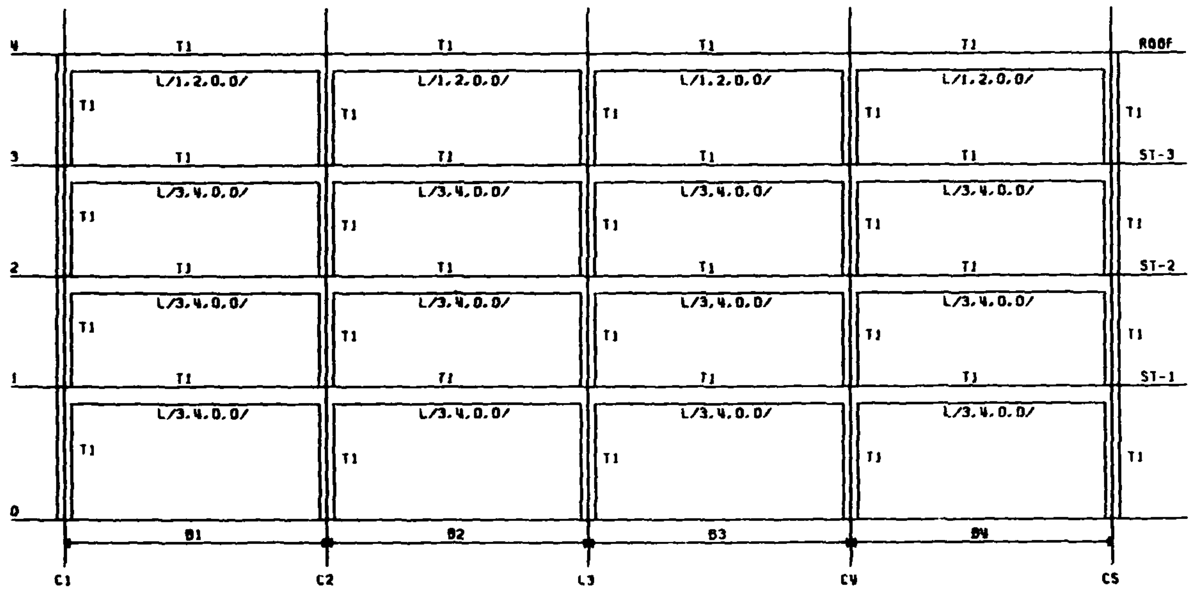
AD-A105 513 COMPUTERS/STRUCTURES INTERNATIONAL OAKLAND CA F/G 13/13
USER'S GUIDE: COMPUTER PROGRAM FOR THREE-DIMENSIONAL ANALYSIS O--ETC(U)
AUG 81 E L WILSON, H H DOVEY, A HABIBULLAH
UNCLASSIFIED WES-IR-K-81-9 NL

2 OF 3
AD
A105513

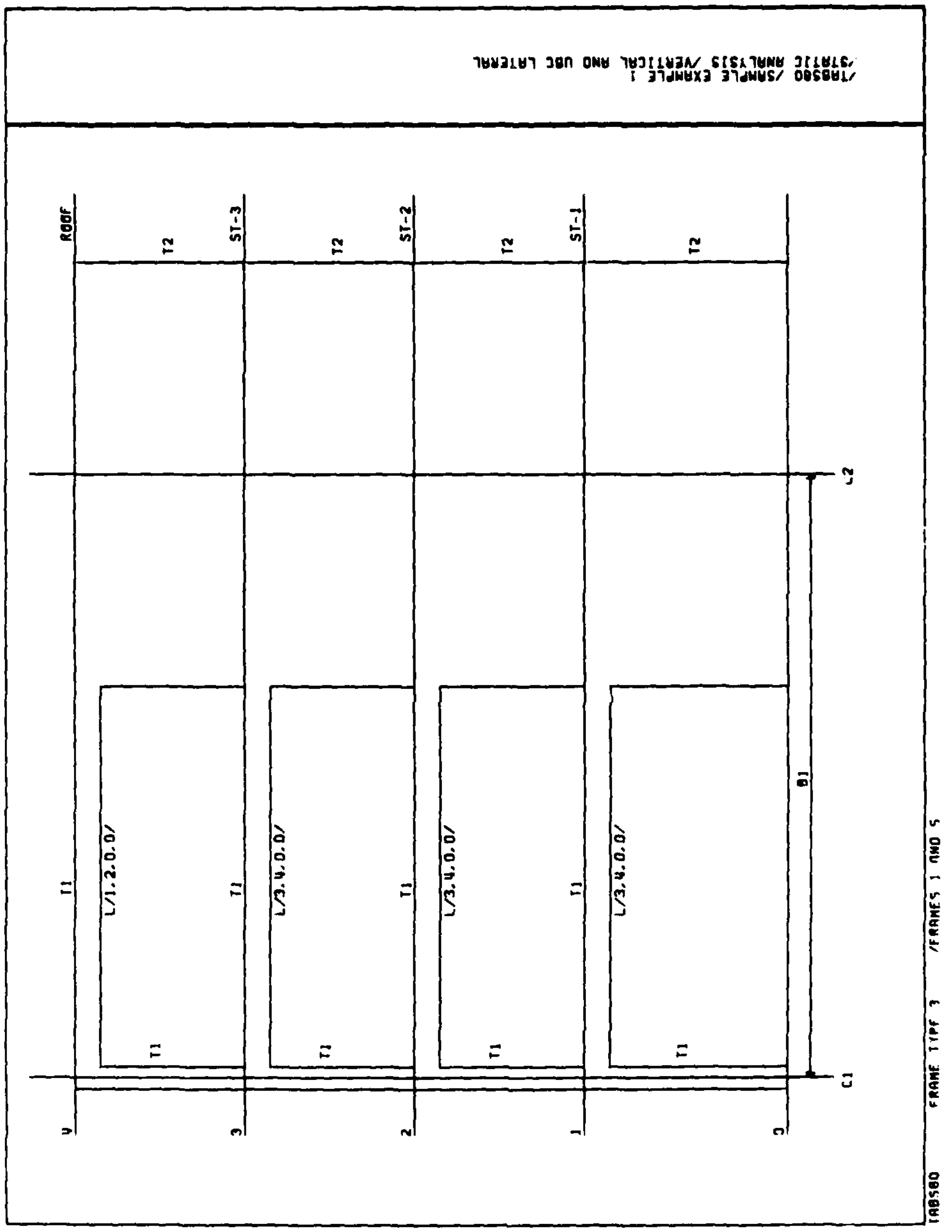


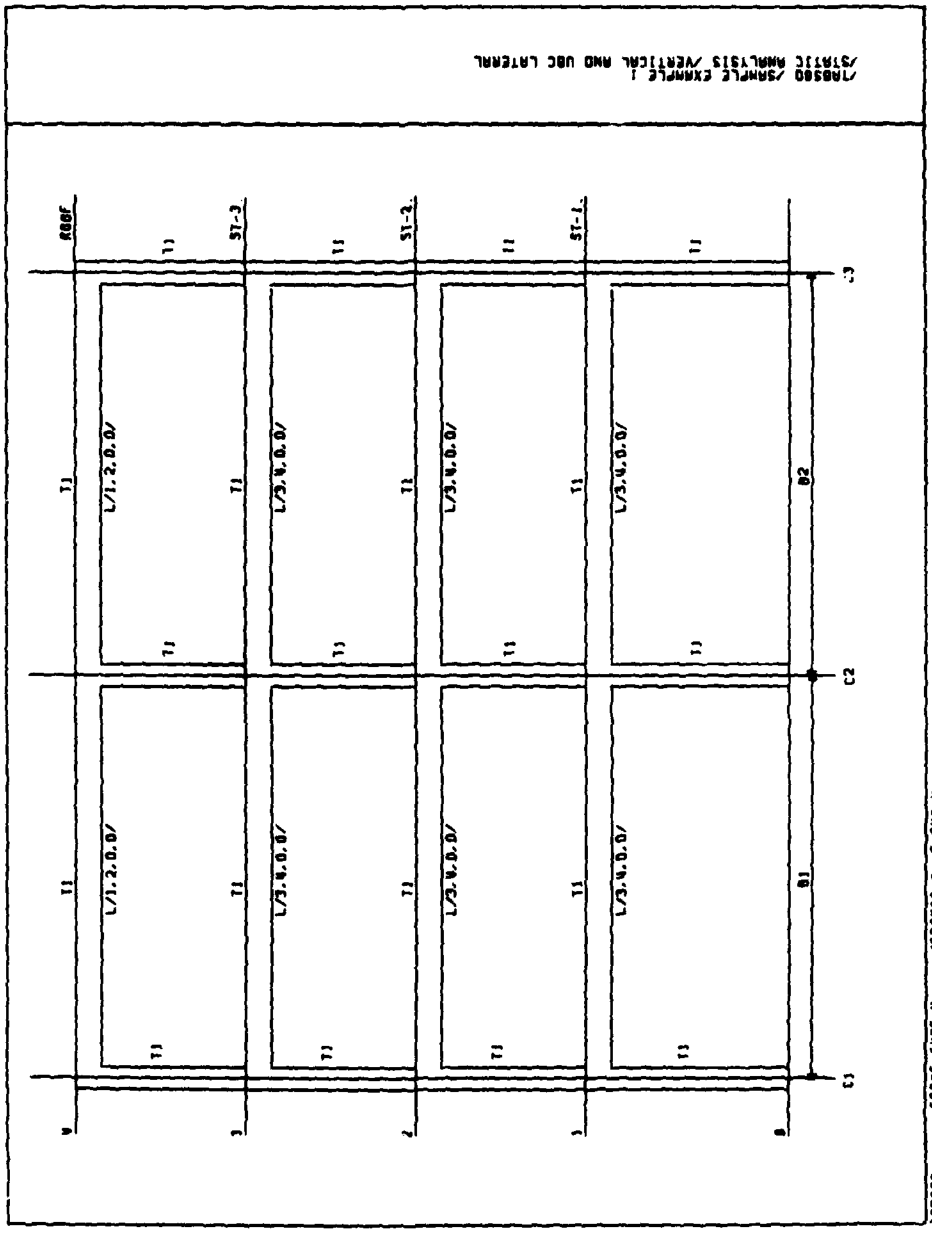

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL
ROOF
ST-3
ST-2
ST-1
C1
C2
C3
C4
B1
B2
B3
T1
T2
L/1,2,0,0/
L/3,4,0,0/
L/5,6,0,0/
L/7,8,0,0/
4
3
2
1
0
TABS80 FRAME TYPE 1 /FRAMES A AND C

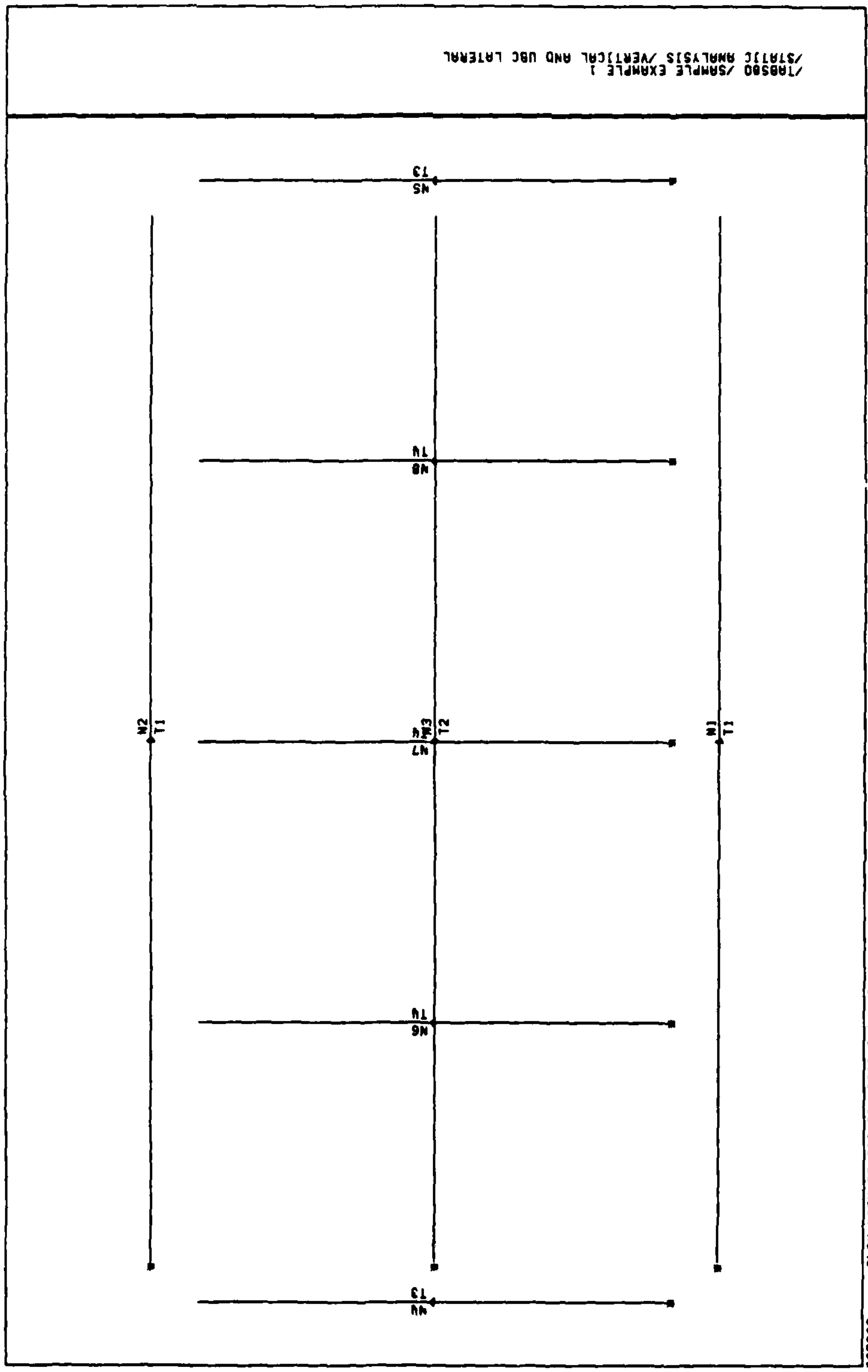
/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL



TABS80 FRAME TYPE 2 /FRAME B


/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL
ROOF
ST-3
ST-2
ST-1
T1
T2
L/1,2,0,0/
L/3,4,0,0/
B1
C1
C2
FRAME TYPE 3 /FRAMES 1 AND 5
TABS80


/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL
ROOF
ST-3
ST-2
ST-1
L/1.2.0.0/
L/3.4.0.0/
T1
B1
B2
C3
C2
TABS80 FRAME TYPE 4 /FRAMES 2, 3 AND 4



TABS80 PLAN VIEW OF FRAMES, DISPLAYING FRAME NUMBERS (N), TYPES (T) AND LOCAL AXES (+)

```
/TABS80 /SAMPLE EXAMPLE 1                                                  PAGE     1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL                                 06/08/80

TOTAL NUMBER OF STORIES IN STRUCTURE--------                  4

NUMBER OF DIFFERENT FRAMES IN STRUCTURE-----                  4

TOTAL NUMBER OF FRAMES IN STRUCTURE---------                  8

TOTAL NUMBER OF STRUCTURAL LOAD CASES-------                  4

TYPE OF ANALYSIS----------------------------                  2

NUMBER OF MODES CONSIDERED------------------                  8

LATERAL STORY TRANSLATION CODE--------------                  0

EXECUTION MODE------------------------------                  0

FRAME JOINT RIGID ZONE MODIFICATION CODE----                  0

FRAME JOINT DISPLACEMENT PRINT FLAG---------                  0

UBC LATERAL SEISMIC FORCE CODE--------------                  1

NUMBER OF STORY MASS PATTERNS---------------                  2

MASTER PEN PLOT FLAG------------------------                  1


CONVERSION DATA FOR STRESSES

LENGTH CONVERSION FACTOR--------------------             12.000
FORCE  CONVERSION FACTOR--------------------           1000.000
```

```
/TABS80 /SAMPLE EXAMPLE 1                                                  PAGE     2
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL                                 06/08/80

STORY MASS TYPE NUMBER----------------------            1
NUMBER OF MASS SEGMENTS---------------------            1
MASS SCALE FACTOR---------------------------     .311E-01

SEGMENT     SEGMENT    COORDINATES OF CENTER       DIMENSIONS OF SEGMENT
 NUMBER       MASS           X          Y              X          Y
    1       746.00         0.00       0.00          48.00      96.00

CALCULATED STORY MASS PROPERTIES

STORY MASS----------------------------------        23.17
MASS MOMENT OF INERTIA----------------------      22241.1
X-ORDINATE OF CENTER OF MASS----------------         0.00
Y-ORDINATE OF CENTER OF MASS----------------         0.00


/TABS80 /SAMPLE EXAMPLE 1                                                  PAGE
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL                                 06/08/80

STORY MASS TYPE NUMBER----------------------            2
NUMBER OF MASS SEGMENTS---------------------            1
MASS SCALE FACTOR---------------------------     .311E-01

SEGMENT     SEGMENT    COORDINATES OF CENTER       DIMENSIONS OF SEGMENT
 NUMBER       MASS           X          Y              X          Y
    1       839.00         0.00       0.00          48.00      96.00

CALCULATED STORY MASS PROPERTIES

STORY MASS----------------------------------        26.06
MASS MOMENT OF INERTIA----------------------      25013.7
X-ORDINATE OF CENTER OF MASS----------------         0.00
Y-ORDINATE OF CENTER OF MASS----------------         0.00
```

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

STRUCTURAL STORY DATA . . .

LEVEL	MASS TYPE	HEIGHT	K-X	K-Y	K-ROTN
ROOF	1	10.00	0.	0.	0.
ST-3	2	10.00	0.	0.	0.
ST-2	2	10.00	0.	0.	0.
ST-1	2	12.00	0.	0.	0.

STRUCTURAL MASS DATA . . .

LEVEL	MASS	MMI	XM	YM
ROOF	23.168	22241.1	0.00	0.00
ST-3	26.056	25013.7	0.00	0.00
ST-2	26.056	25013.7	0.00	0.00
ST-1	26.056	25013.7	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION A . . .

LEVEL	FX	FY	X	Y
ROOF	0.00	0.00	4.80	4.80
ST-3	0.00	0.00	4.80	4.80
ST-2	0.00	0.00	4.80	4.80
ST-1	0.00	0.00	4.80	4.80

STRUCTURAL LATERAL LOAD CONDITION B . . .

LEVEL	FX	FY	X	Y
ROOF	0.00	0.00	4.80	4.80
ST-3	0.00	0.00	4.80	4.80
ST-2	0.00	0.00	4.80	4.80
ST-1	0.00	0.00	4.80	4.80

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

/FRAMES A AND C

FRAME IDENTIFICATION NUMBER------------------	1
NUMBER OF COLUMN LINES IN FRAME-------------	4
NUMBER OF STORY LEVELS IN FRAME-------------	4
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	2
NUMBER OF BEAM PROPERTIES-------------------	1
NUMBER OF BEAM SPAN LOADING PATTERNS--------	8
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----	2
NUMBER OF PANEL ELEMENTS IN FRAME-----------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------	0
FRAME PEN PLOT FLAG-------------------------	0
STORY CONNECTIVITY CODE---------------------	0

BAY WIDTHS
36.00 36.00 24.00

SILL DEPTHS
0.00 0.00 0.00

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	W	T
- 1	.150	432000.0	.177E+01	.261E+00	1.47	1.33	1.33
- 2	.150	432000.0	.253E+02	.135E+04	21.11	25.33	1.00

BEAM SECTION PROPERTY DATA

ID	U	E	I	K	C	DB	DA	AV	T
- 1	.180	432000.0	.281E+00	4.00	.50	1.50	0.00	1.25	1.00

BEAM LOADING DATA . . . FIXED END FORCES

ID	NCON	ML	VL	MR	VR
1	2	0.00	0.00	0.00	0.00
2	2	0.00	0.00	0.00	0.00
3	2	0.00	0.00	0.00	0.00
4	2	0.00	0.00	0.00	0.00
5	2	0.00	0.00	0.00	0.00
6	2	0.00	0.00	0.00	0.00
7	2	0.00	0.00	0.00	0.00
8	2	0.00	0.00	0.00	0.00

BEAM LOADING DATA . . . UNIFORM AND COLUMN POINT LDS

ID	WW	FL	FR
1	0.000	0.00	0.00
2	0.000	0.00	0.00

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

BEAM LOADING DATA . . . UNIFORM AND COLUMN POINT LDS

ID	WW	FL	FR
3	0.000	0.00	0.00
4	0.000	0.00	0.00
5	0.000	26.00	0.00
6	0.000	4.00	0.00
7	0.000	30.00	0.00
8	0.000	8.00	0.00

BEAM LOADING DATA . . . CONCENTRATED LOADS

ID	N	DIST	P
1	1	8.00	13.00
	2	16.00	13.00
2	1	8.00	2.00
	2	16.00	2.00
3	1	8.00	15.00
	2	16.00	15.00
4	1	8.00	4.00
	2	16.00	4.00
5	1	20.00	13.00
	2	28.00	13.00
6	1	20.00	2.00
	2	28.00	2.00
7	1	20.00	15.00
	2	28.00	15.00
8	1	20.00	4.00
	2	28.00	4.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3	4
ROOF	1	2	1	1
ST-3	1	2	1	1
ST-2	1	2	1	1
ST-1	1	2	1	1

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2	3
ROOF	1	1	1
ST-3	1	1	1
ST-2	1	1	1
ST-1	1	1	1

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION I

LEVEL	1	2	3
ROOF	1	5	1
ST-3	3	7	3
ST-2	3	7	3
ST-1	3	7	3

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION II

LEVEL	1	2	3
ROOF	2	6	2
ST-3	4	8	4
ST-2	4	8	4
ST-1	4	8	4

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION III

LEVEL	1	2	3
ROOF	0	0	0
ST-3	0	0	0
ST-2	0	0	0
ST-1	0	0	0

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION IV

LEVEL	1	2	3
ROOF	0	0	0
ST-3	0	0	0
ST-2	0	0	0

```
/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

LEVEL      1   2   3

ST-1       0   0   0

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

    LEVEL/---------VERTICAL LOAD COND---------/
      ID          I        II       III       IV

    ROOF      165.26     16.00     0.00     0.00
    ST-3      181.26     32.00     0.00     0.00
    ST-2      181.26     32.00     0.00     0.00
    ST-1      190.45     32.00     0.00     0.00


FRAME NO.=    1
TIME     =   .11
```

```
PAGE     8   /TABS80 /SAMPLE EXAMPLE 1                                          PAGE     9
04/09/81    /STATIC ANALYSIS /VERTICAL AND UBC LATERAL                             04/09/81

/FRAME B

FRAME IDENTIFICATION NUMBER------------------                  2
NUMBER OF COLUMN LINES IN FRAME--------------                  5
NUMBER OF STORY LEVELS IN FRAME--------------                  4
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES---                  1
NUMBER OF BEAM PROPERTIES--------------------                  1
NUMBER OF BEAM SPAN LOADING PATTERNS---------                  4
MAXIMUM POINT LOADS IN ANY SPAN LOADING------                  2
NUMBER OF PANEL ELEMENTS IN FRAME------------                  0
NUMBER OF DIAGONAL ELEMENTS IN FRAME---------                  0
FRAME PEN PLOT FLAG--------------------------                  0
STORY CONNECTIVITY CODE----------------------                  0


BAY WIDTHS
   24.00       24.00      24.00      24.00

SILL DEPTHS
    0.00        0.00       0.00       0.00

COLUMN SECTION PROPERTY DATA

    ID      U        E          A          I         AV      W      T
 -  1     .150   432000.0  .177E+01  .261E+00      1.47   1.33   1.33

BEAM SECTION PROPERTY DATA

    ID      U        E          I        K       C     DB     DA      AV     T
 -  1     .180   432000.0  .281E+00   4.00    .50   1.50   0.00    1.25   1.00

BEAM LOADING DATA . . . FIXED END FORCES

    ID    NCON          ML       VL       MR       VR
    1      2          0.00     0.00     0.00     0.00
    2      2          0.00     0.00     0.00     0.00
    3      2          0.00     0.00     0.00     0.00
    4      2          0.00     0.00     0.00     0.00

BEAM LOADING DATA . . . UNIFORM AND COLUMN POINT LDS

    ID        WW        FL       FR
    1       0.000     0.00     0.00
    2       0.000     0.00     0.00
    3       0.000     0.00     0.00
    4       0.000     0.00     0.00
```

BEAM LOADING DATA . . . CONCENTRATED LOADS

ID	N	DIST	P
1			
	1	8.00	26.00
	2	16.00	26.00
2			
	1	8.00	4.00
	2	16.00	4.00
3			
	1	8.00	30.00
	2	16.00	30.00
4			
	1	8.00	8.00
	2	16.00	8.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3	4	5
ROOF	1	1	1	1	1
ST-3	1	1	1	1	1
ST-2	1	1	1	1	1
ST-1	1	1	1	1	1

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2	3	4
ROOF	1	1	1	1
ST-3	1	1	1	1
ST-2	1	1	1	1
ST-1	1	1	1	1

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION I

LEVEL	1	2	3	4
ROOF	1	1	1	1
ST-3	3	3	3	3
ST-2	3	3	3	3
ST-1	3	3	3	3

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION II

LEVEL	1	2	3	4
ROOF	2	2	2	2
ST-3	4	4	4	4
ST-2	4	4	4	4
ST-1	4	4	4	4

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION III

LEVEL	1	2	3	4
ROOF	0	0	0	0
ST-3	0	0	0	0
ST-2	0	0	0	0
ST-1	0	0	0	0

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION IV

LEVEL	1	2	3	4
ROOF	0	0	0	0
ST-3	0	0	0	0
ST-2	0	0	0	0
ST-1	0	0	0	0

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	--------VERTICAL LOAD COND--------/ I	II	III	IV
ROOF	241.67	32.00	0.00	0.00
ST-3	273.67	64.00	0.00	0.00
ST-2	273.67	64.00	0.00	0.00
ST-1	276.32	64.00	0.00	0.00

FRAME NO.= 2
TIME = .11

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

/FRAMES 1 AND 5

FRAME IDENTIFICATION NUMBER------------------	3
NUMBER OF COLUMN LINES IN FRAME--------------	2
NUMBER OF STORY LEVELS IN FRAME--------------	4
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	2
NUMBER OF BEAM PROPERTIES--------------------	1
NUMBER OF BEAM SPAN LOADING PATTERNS---------	4
NUMBER OF BEAM SPAN LOADS IN ANY SPAN LOADING-----	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING------	0
NUMBER OF PANEL ELEMENTS IN FRAME------------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME---------	0
FRAME PEN PLOT FLAG--------------------------	0
STORY CONNECTIVITY CODE----------------------	0

BAY WIDTHS
36.00

SILL DEPTHS
0.00

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	d	T
1	.150	432000.0	.177E+01	.261E+00	1.47	1.33	1.33
2	.150	432000.0	.253E+02	.135E+04	21.11	25.33	1.00

BEAM SECTION PROPERTY DATA

ID	U	E	I	K	C	DB	DA	AV	T
1	.180	432000.0	.281E+00	4.00	.50	1.50	0.00	1.25	1.00

BEAM LOADING DATA . . . FIXED END FORCES

ID	NCON	ML	VL	MR	VR
1	0	0.00	0.00	0.00	0.00
2	0	0.00	0.00	0.00	0.00
3	0	0.00	0.00	0.00	0.00
4	0	0.00	0.00	0.00	0.00

BEAM LOADING DATA . . . UNIFORM AND COLUMN POINT LDS

ID	WW	FL	FR
1	.550	0.00	0.00
2	.080	0.00	0.00
3	.630	0.00	0.00
4	.160	0.00	0.00

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2
ROOF	1	2
ST-3	1	2
ST-2	1	2
ST-1	1	2

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1
ROOF	1
ST-3	1
ST-2	1
ST-1	1

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION I

LEVEL	1
ROOF	1
ST-3	3
ST-2	3
ST-1	3

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION II

LEVEL	1
ROOF	2
ST-3	4
ST-2	4
ST-1	4

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION III

LEVEL	1
ROOF	0
ST-3	0
ST-2	0

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

LEVEL	1
ST-1	0

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION IV

LEVEL	1
ROOF	0
ST-3	0
ST-2	0
ST-1	0

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	---------VERTICAL LOAD COND--------/ I	II	III	IV
ROOF	72.88	3.95	0.00	0.00
ST-3	76.83	7.89	0.00	0.00
ST-2	76.83	7.89	0.00	0.00
ST-1	84.96	7.89	0.00	0.00

FRAME NO.= 3
TIME = .05

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

/FRAMES 2, 3 AND 4

FRAME IDENTIFICATION NUMBER------------------	4
NUMBER OF COLUMN LINES IN FRAME--------------	3
NUMBER OF STORY LEVELS IN FRAME--------------	4
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	1
NUMBER OF BEAM PROPERTIES--------------------	1
NUMBER OF BEAM SPAN LOADING PATTERNS--------	4
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----	0
NUMBER OF PANEL ELEMENTS IN FRAME-----------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------	0
FRAME PEN PLOT FLAG--------------------------	0
STORY CONNECTIVITY CODE----------------------	0

BAY WIDTHS
24.00 24.00

SILL DEPTHS
0.00 0.00

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	W	T
- 1	.150	432000.0	.177E+01	.261E+00	1.47	1.33	1.33

BEAM SECTION PROPERTY DATA

ID	U	E	I	K	C	DB	DA	AV	T
- 1	.180	432000.0	.281E+00	4.00	.50	1.50	0.00	1.25	1.00

BEAM LOADING DATA . . . FIXED END FORCES

ID	NCON	ML	VL	MR	VR
1	0	0.00	0.00	0.00	0.00
2	0	0.00	0.00	0.00	0.00
3	0	0.00	0.00	0.00	0.00
4	0	0.00	0.00	0.00	0.00

BEAM LOADING DATA . . . UNIFORM AND COLUMN POINT LDS

ID	WW	FL	FR
1	1.100	0.00	0.00
2	.160	0.00	0.00
3	1.250	0.00	0.00
4	.320	0.00	0.00

```
/TABS80 /SAMPLE EXAMPLE 1                                   PAGE  16
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL                  04/09/81

INPUT/GENERATED COLUMN LOCATIONS

LEVEL     1   2   3

ROOF      1   1   1
ST-3      1   1   1
ST-2      1   1   1
ST-1      1   1   1

INPUT/GENERATED BEAM LOCATIONS

LEVEL     1   2

ROOF      1   1
ST-3      1   1
ST-2      1   1
ST-1      1   1

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION   I

LEVEL     1   2

ROOF      1   1
ST-3      3   3
ST-2      3   3
ST-1      3   3

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION  II

LEVEL     1   2

ROOF      2   2
ST-3      4   4
ST-2      4   4
ST-1      4   4

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION III

LEVEL     1   2

ROOF      0   0
ST-3      0   0
ST-2      0   0
```

```
/TABS80 /SAMPLE EXAMPLE 1                                   PAGE  17
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL                  04/09/81

LEVEL     1   2

ST-1      0   0

INPUT/GENERATED BEAM LOADS FOR LOAD CONDITION  IV

LEVEL     1   2

ROOF      0   0
ST-3      0   0
ST-2      0   0
ST-1      0   0

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

   LEVEL/--------VERTICAL LOAD COND--------/
     ID        I        II      III      IV

   ROOF     72.42     7.89     0.00     0.00
   ST-3     79.82    15.79     0.00     0.00
   ST-2     79.82    15.79     0.00     0.00
   ST-1     81.42    15.79     0.00     0.00

FRAME NO.=     4
TIME     =   .07
```

```
/TABS80 /SAMPLE EXAMPLE 1                                   PAGE  18
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL                  06/08/80

FRAME LOCATION DATA

FRAME FRAME PRINT
  NO   TYPE  CODE       X1        Y1        X2        Y2  /--FRAME LOCATION--/

   1     1     0    -45.00    -24.00     45.00    -24.00  FRAME A
   2     1     0    -45.00     24.00     45.00     24.00  FRAME C
   3     2     0    -45.00      0.00     45.00      0.00  FRAME B
   4     3     0    -48.00    -20.00    -48.00     20.00  FRAME 1
   5     3     0     48.00    -20.00     48.00     20.00  FRAME 5
   6     4     0    -24.00    -20.00    -24.00     20.00  FRAME 2
   7     4     0      0.00    -20.00      0.00     20.00  FRAME 3
   8     4     0     24.00    -20.00     24.00     20.00  FRAME 4
```

MODE NUMBER	TIME PERIOD
1	.2027
2	.2014
3	.1179
4	.0518
5	.0517
6	.0300
7	.C268
8	.C268

MODE SHAPES

LEVEL	DIRN	1	2	3	4
ROCF	X	0.CCCC00	.153726	0.CC0000	0.000000
ROCF	Y	.153898	0.C00000	0.0C0000	.106284
ROCF	ROTN	0.00CC00	0.C00000	.0C4972	0.G00C00
ST-3	X	0.0CCC00	.110420	0.CC0000	0.0C0C00
ST-3	Y	.11C350	0.C00C00	0.CC0000	-.030146
ST-3	RCTN	0.0CCC00	0.C00C00	.CC3599	0.000000
ST-2	X	0.CCC000	.C66317	0.CC0000	0.0C0C00
ST-2	Y	.G6E142	0.C000C0	0.CC0000	-.123258
ST-2	ROTN	0.CCCG00	0.C00000	.CC2130	0.000000
ST-1	X	0.CCCC00	.C27862	0.00C000	0.0C0C00
ST-1	Y	.C27708	0.CC0C00	0.C00000	-.110605
ST-1	ROTN	0.0GCC00	0.C00000	.CC0891	0.000C0C

MODE SHAPES

LEVEL	DIRN	5	6	7	8
ROCF	X	.10E447	0.C00C00	C.CC0000	.080238
ROCF	Y	0.CCCC00	0.C00000	.C80160	0.0C0C00
ROCF	RCTN	0.C0CC00	.C03425	0.CC0000	0.0C0C0C
ST-3	X	-.025881	0.C00G00	0.CC0000	-.113748
ST-3	Y	0.00C000	0.C00000	-.113795	0.000C0C
ST-3	ROTN	0.CCCC00	-.C00979	0.GC0000	0.00CC00
ST-2	X	-.12315E	0.C00C00	0.CC00G0	-.03325E
ST-2	Y	0.C0C0G0	0.C00000	-.C33147	0.0C0C0C
ST-2	RCTN	0.CCCC00	-.C03979	C.CC0000	0.0C0C0C
ST-1	X	-.11C652	0.C00000	0.CC0000	.136408
ST-1	Y	0.CCCCG0	0.C00C00	.136446	0.0C0C00
ST-1	ROTN	0.CCCC00	-.C03572	0.CC0000	0.000CC0

MODAL PARTICIPATION FACTORS

MODE NUMBER	P-FACTOR DIRECTION	P-FACTOR VALUE
1	X	0.00CC0
	Y	8.88612
	ROTN	0.CCCC0
2	X	8.89251
	Y	0.C0CC0
	ROTN	0.C0CC0
3	X	0.CCCC0
	Y	0.C0CG0
	ROTN	275.17560
4	X	0.00C00
	Y	-4.41664
	ROTN	0.C0CC0
5	X	-4.40453
	Y	0.00CCG
	ROTN	0.CCCC0
6	X	0.0GC00
	Y	0.C0CC0
	ROTN	-137.16642
7	X	0.C0CC0
	Y	1.58362
	ROTN	0.C0CC0
8	X	1.58181
	Y	0.C0CC0
	ROTN	0.00CC0

```
STATIC SEISMIC LOAD CALCULATION DATA . . .
UBC 1976 (SEAOC CODE)

UBC ZONE FACTOR (Z)------------------------------    1.00
PREDOMINANT SOIL PERIOD (TS)---------------------    0.00
UBC IMPORTANCE FACTOR (I)------------------------    1.00
GRAVITATIONAL ACCELERATION-----------------------   32.20

LOAD CONDITION A (X-DIRECTION) . . .

TOP    LEVEL OF TRIANGULAR DISTRIBUTION-----           4
BOTTOM LEVEL OF TRIANGULAR DISTRIBUTION-----           0
PERIOD OF PREDOMINANT X STRUCTURAL MODE-----        .201
UBC STRUCTURAL SYSTEM FACTOR----------------       1.330

LOAD CONDITION B (Y-DIRECTION) . . .

TOP    LEVEL OF TRIANGULAR DISTRIBUTION-----           4
BOTTOM LEVEL OF TRIANGULAR DISTRIBUTION-----           0
PERIOD OF PREDOMINANT Y STRUCTURAL MODE-----        .203
UBC STRUCTURAL SYSTEM FACTOR----------------       1.330
```



```
UNIFORM BUILDING CODE SEISMIC LOADS FOR DIRECTION  X

V = Z SICK W          SC=0.14 MAX

Z =    1.CC00

S =    1.5C00
I =    1.0C00
C =     .1486
K =    1.3300

W = 3263.C104

V =     .1862W
  =  607.5725

FT=    0.C000


UNIFORM BUILDING CODE SEISMIC LOADS FOR DIRECTION  Y

V = Z SICK W          SC=0.14 MAX

Z =    1.0000

S =    1.5C00
I =    1.CC00
C =     .1481
K =    1.3300

W = 3263.C104

V =     .18624
  =  6C7.5725

FT=    0.C000
```

/TABS80 /SAMPLE EXAMPLE 1 PAGE 23
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL 06/08/8C

STRUCTURAL LATERAL LOAD CONDITIONS
AS ADJUSTED BY UBC SEISMIC REQUIREMENTS

STRUCTURAL LATERAL LOAD CONDITION A (X-DIRECTION). . .

LEVEL	FX	FY	X	Y
ROOF	219.55	0.0C	4.80	4.8C
ST-3	188.13	0.0C	4.80	4.8C
ST-2	129.34	0.0C	4.80	4.8C
ST-1	70.55	0.0C	4.80	4.8C

STRUCTURAL LATERAL LOAD CONDITION B (Y-DIRECTION). . .

LEVEL	FX	FY	X	Y
ROOF	0.CC	219.55	4.80	4.8C
ST-3	0.CC	188.13	4.80	4.8C
ST-2	0.0C	129.34	4.80	4.8C
ST-1	0.00	70.55	4.80	4.8C

/TABS80 /SAMPLE EXAMPLE 1 PAGE 24
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL 04/09/81

STATIC LOAD CONDITION DISPLACEMENTS

DISPLACEMENTS ARE AT THE CENTERS OF MASS OF THE RESPECTIVE LEVELS

LEVEL	DIRN	LOAD CONDITIONS I	II	III	IV	A	B
ROOF	X	-.00004	-.00001	0.00000	0.00000	.01024	0.00000
ROOF	Y	-.00056	-.00009	0.00000	0.00000	0.00000	.01038
ROOF	ROTN	0.00000	0.00000	0.00000	0.00000	.00002	-.00002
ST-3	X	-.00002	-.00000	0.00000	0.00000	.00739	0.00000
ST-3	Y	-.00035	-.00006	0.00000	0.00000	0.00000	.00748
ST-3	ROTN	0.00000	0.00000	0.00000	0.00000	.00001	-.00001
ST-2	X	-.00001	-.00000	0.00000	0.00000	.00448	0.00000
ST-2	Y	-.00018	-.00003	0.00000	0.00000	0.00000	.00453
ST-2	ROTN	0.00000	0.00000	0.00000	0.00000	.00001	-.00001
ST-1	X	-.00000	-.00000	0.00000	0.00000	.00191	0.00000
ST-1	Y	-.00005	-.00001	0.00000	0.00000	0.00000	.00193
ST-1	ROTN	0.00000	0.00000	0.00000	0.00000	.00000	-.00000

/TABS80 /SAMPLE EXAMPLE 1 PAGE 25
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL 04/09/81

LOAD CASE DEFINITION DATA

NO	IC	I	II	III	IV	A	B	DYN-1	DYN-2	DYN-3	LOAD CASE ID
1	0	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/DEAD LOAD
2	0	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/LIVE LOAD
3	0	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	/X-SEISMIC
4	0	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	/Y-SEISMIC

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS MODAL COMBINATION
DYNAMIC 3 . . . CQC MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

PAGE 26
06/08/80

LATERAL FRAME DISPLACEMENTS IN FRAME 4

LEVEL	/DEAD LOAD	/LIVE LOAD	/X-SEISMIC	/Y-SEISMIC
ROOF	-.000555	-.000089	-.000422	.010798
ST-3	-.000353	-.000057	-.000303	.007783
ST-2	-.000176	-.000029	-.000183	.004710
ST-1	-.000055	-.000009	-.000078	.002003

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

PAGE 27
04/09/81

COLUMN FORCES AT LEVEL ST-1 IN FRAME 4

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	13.48	22.89	-81.19	-3.46
1	/LIVE LOAD	2.95	5.01	-13.90	-.76
1	/X-SEISMIC	.22	.05	-.09	-.03
1	/Y-SEISMIC	-5.74	-1.25	2.30	.67
2	/DEAD LOAD	.15	.02	-151.36	-.02
2	/LIVE LOAD	.02	.00	-27.50	-.00
2	/X-SEISMIC	.26	.12	-.00	-.04
2	/Y-SEISMIC	-6.79	-3.03	.00	.93
3	/DEAD LOAD	-13.24	-22.95	-80.94	3.45
3	/LIVE LOAD	-2.91	-5.02	-13.86	.76
3	/X-SEISMIC	.22	.05	.09	-.03
3	/Y-SEISMIC	-5.74	-1.25	-2.30	.67

BEAM FORCES AT LEVEL ST-1 IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-54.11	66.90	34.36	-16.15	-17.28
1	/LIVE LOAD	-11.68	14.56	7.46	-3.50	-3.75
1	/X-SEISMIC	-.23	-.21	-.01	-.02	.02
1	/Y-SEISMIC	5.81	5.40	.21	.49	-.49
2	/DEAD LOAD	-67.28	53.71	34.38	-17.32	-16.12
2	/LIVE LOAD	-14.63	11.61	7.47	-3.76	-3.49
2	/X-SEISMIC	-.21	-.23	.01	-.02	.02
2	/Y-SEISMIC	5.40	5.81	-.21	.49	-.49

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
-.03	-.01	0.00	0.00	-.09	2.27

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

PAGE 28
04/09/81

COLUMN FORCES AT LEVEL ST-2 IN FRAME 4

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	36.77	29.86	-60.19	-7.84
1	/LIVE LOAD	7.85	6.22	-9.97	-1.66
1	/X-SEISMIC	.15	.10	-.07	-.03
1	/Y-SEISMIC	-3.89	-2.51	1.81	.75
2	/DEAD LOAD	.35	.20	-111.91	-.07
2	/LIVE LOAD	.06	.03	-19.56	-.01
2	/X-SEISMIC	.27	.21	-.00	-.06
2	/Y-SEISMIC	-7.02	-5.31	.00	1.45
3	/DEAD LOAD	-36.31	-29.71	-59.97	7.77
3	/LIVE LOAD	-7.78	-6.20	-9.94	1.64
3	/X-SEISMIC	.15	.10	.07	-.03
3	/Y-SEISMIC	-3.89	-2.51	-1.81	.75

BEAM FORCES AT LEVEL ST-2 IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-58.37	64.34	33.42	-16.46	-16.98
1	/LIVE LOAD	-12.69	13.99	7.23	-3.57	-3.68
1	/X-SEISMIC	-.28	-.27	-.01	-.02	.02
1	/Y-SEISMIC	7.18	6.80	.19	.62	-.62
2	/DEAD LOAD	-65.03	57.64	33.46	-17.04	-16.39
2	/LIVE LOAD	-14.09	12.58	7.23	-3.69	-3.56
2	/X-SEISMIC	-.27	-.28	.01	-.02	.02
2	/Y-SEISMIC	6.80	7.18	-.19	.62	-.62

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
-.14	-.02	0.00	0.00	-.12	2.96

COLUMN FORCES AT LEVEL ST-3 IN FRAME 4

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	27.70	24.63	-39.42	-6.16
1	/LIVE LOAD	6.36	6.26	-5.98	-1.48
1	/X-SEISMIC	.15	.12	-.05	-.03
1	/Y-SEISMIC	-3.95	-3.08	1.19	.83
2	/DEAD LOAD	.43	.30	-73.57	-.09
2	/LIVE LOAD	.07	.05	-11.75	-.01
2	/X-SEISMIC	.27	.23	.00	-.06
2	/Y-SEISMIC	-6.94	-5.88	-.00	1.51
3	/DEAD LOAD	-27.18	-24.36	-39.26	6.06
3	/LIVE LOAD	-6.28	-6.22	-5.95	1.47
3	/X-SEISMIC	.15	.12	.05	-.03
3	/Y-SEISMIC	-3.95	-3.08	-1.19	.83

BEAM FORCES AT LEVEL ST-3 IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-59.73	63.35	33.22	-16.56	-16.88
1	/LIVE LOAD	-12.47	14.04	7.31	-3.56	-3.70
1	/X-SEISMIC	-.31	-.29	-.01	-.03	.03
1	/Y-SEISMIC	7.85	7.46	.19	.68	-.68
2	/DEAD LOAD	-64.29	58.75	33.26	-16.96	-16.47
2	/LIVE LOAD	-14.19	12.31	7.32	-3.71	-3.54
2	/X-SEISMIC	-.29	-.31	.01	-.03	.03
2	/Y-SEISMIC	7.46	7.85	-.19	.68	-.68

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
-.18	-.03	0.00	0.00	-.12	3.16

COLUMN FORCES AT LEVEL ROOF IN FRAME 4

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	36.88	42.31	-18.54	-9.32
1	/LIVE LOAD	6.35	5.27	-1.99	-1.37
1	/X-SEISMIC	.16	.19	-.02	-.04
1	/Y-SEISMIC	-3.98	-4.90	.51	1.04
2	/DEAD LOAD	.56	.60	-35.41	-.14
2	/LIVE LOAD	.09	.10	-3.92	-.02
2	/X-SEISMIC	.30	.35	.00	-.08
2	/Y-SEISMIC	-7.69	-9.82	-.00	1.94
3	/DEAD LOAD	-36.25	-41.64	-18.47	9.16
3	/LIVE LOAD	-6.25	-5.16	-1.98	1.34
3	/X-SEISMIC	.16	.19	.02	-.04
3	/Y-SEISMIC	-3.98	-4.90	-.51	1.04

BEAM FORCES AT LEVEL ROOF IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-46.69	60.12	31.85	-14.43	-15.61
1	/LIVE LOAD	-6.14	6.92	3.75	-1.78	-1.85
1	/X-SEISMIC	-.24	-.22	-.01	-.02	.02
1	/Y-SEISMIC	6.12	5.53	.30	.51	-.51
2	/DEAD LOAD	-60.88	45.84	31.93	-15.68	-14.36
2	/LIVE LOAD	-7.04	6.00	3.76	-1.96	-1.77
2	/X-SEISMIC	-.22	-.24	.01	-.02	.02
2	/Y-SEISMIC	5.53	6.12	-.30	.51	-.51

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
-.29	-.05	0.00	0.00	-.16	4.03

FRAME NO. = 1
STRESS TIME= .20

LATERAL FRAME DISPLACEMENTS IN FRAME A

LEVEL	/DEAD LOAD	/LIVE LOAD	/X-SEISMIC	/Y-SEISMIC
ROOF	-.000039	-.000007	.009814	.000422
ST-3	-.000025	-.000004	.007087	.000303
ST-2	-.000012	-.000002	.004298	.000183
ST-1	-.000004	-.000001	.001833	.000078

COLUMN FORCES AT LEVEL ST-1 IN FRAME A

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	16.84	28.88	-75.89	-4.35
1	/LIVE LOAD	4.01	6.87	-13.31	-1.04
1	/X-SEISMIC	-5.59	-1.72	3.27	.70
1	/Y-SEISMIC	-.24	-.07	.14	.03
2	/DEAD LOAD	34.78	-37.18	-416.47	.23
2	/LIVE LOAD	6.73	-7.33	-56.89	.06
2	/X-SEISMIC	-8672.44	5654.67	-.16	287.41
2	/Y-SEISMIC	-370.49	243.34	-.01	12.11
3	/DEAD LOAD	1.31	2.23	-148.67	-.34
3	/LIVE LOAD	.32	.54	-28.23	-.08
3	/X-SEISMIC	-6.45	-3.20	-1.10	.92
3	/Y-SEISMIC	-.27	-.14	-.05	.04
4	/DEAD LOAD	-17.26	-29.63	-77.20	4.47
4	/LIVE LOAD	-4.10	-7.04	-13.57	1.06
4	/X-SEISMIC	-5.25	-1.15	-2.01	.61
4	/Y-SEISMIC	-.22	-.05	-.09	.03

BEAM FORCES AT LEVEL ST-1 IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-70.04	91.35	45.75	-16.61	-18.49
1	/LIVE LOAD	-16.54	21.56	11.18	-3.78	-4.22
1	/X-SEISMIC	7.12	6.79	.17	.61	-.61
1	/Y-SEISMIC	.30	.29	.01	.03	-.03
2	/DEAD LOAD	-85.69	82.96	40.19	-17.67	-17.43
2	/LIVE LOAD	-20.16	19.66	9.52	-4.02	-3.98
2	/X-SEISMIC	6.49	6.48	.01	.57	-.57
2	/Y-SEISMIC	.28	.28	.00	.02	-.02
3	/DEAD LOAD	-88.46	72.23	45.27	-18.27	-16.83
3	/LIVE LOAD	-20.93	17.00	11.07	-4.17	-3.83
3	/X-SEISMIC	4.77	5.25	-.24	.44	-.44
3	/Y-SEISMIC	.20	.22	-.01	.02	-.02

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
.00	.00	0.00	0.00	289.63	12.20

COLUMN FORCES AT LEVEL ST-2 IN FRAME A

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	45.67	36.87	-56.09	-9.71
1	/LIVE LOAD	10.62	8.37	-9.53	-2.23
1	/X-SEISMIC	-4.76	-3.60	2.66	.98
1	/Y-SEISMIC	-.21	-.15	.11	.04
2	/DEAD LOAD	21.47	-24.49	-304.71	.36
2	/LIVE LOAD	3.49	-4.17	-40.65	.08
2	/X-SEISMIC	-5251.87	3112.13	-.12	251.73
2	/Y-SEISMIC	-226.39	135.41	-.01	10.70
3	/DEAD LOAD	3.32	2.47	-109.79	-.68
3	/LIVE LOAD	.74	.50	-20.07	-.15
3	/X-SEISMIC	-7.35	-5.90	-.97	1.56
3	/Y-SEISMIC	-.32	-.25	-.04	.07
4	/DEAD LOAD	-47.10	-38.28	-57.18	10.04
4	/LIVE LOAD	-10.92	-8.65	-9.74	2.30
4	/X-SEISMIC	-3.48	-2.23	-1.57	.67
4	/Y-SEISMIC	-.15	-.09	-.07	.03

BEAM FORCES AT LEVEL ST-2 IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-74.04	89.61	43.70	-16.86	-18.24
1	/LIVE LOAD	-17.66	21.05	10.59	-3.85	-4.15
1	/X-SEISMIC	9.48	9.52	-.02	.84	-.84
1	/Y-SEISMIC	.41	.41	-.00	.04	-.04
2	/DEAD LOAD	-97.21	81.19	40.44	-17.82	-17.29
2	/LIVE LOAD	-20.49	19.25	9.69	-4.05	-3.95
2	/X-SEISMIC	9.28	8.94	.17	.80	-.80
2	/Y-SEISMIC	.40	.38	.01	.03	-.03
3	/DEAD LOAD	-86.03	77.15	43.23	-17.94	-17.16
3	/LIVE LOAD	-20.34	18.28	10.39	-4.09	-3.91
3	/X-SEISPIC	5.91	6.42	-.26	.54	-.54
3	/Y-SEISMIC	.25	.28	-.01	.02	-.02

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
.01	.00	0.00	0.00	254.95	10.84

COLUMN FORCES AT LEVEL ST-3 IN FRAME A

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	33.82	30.34	-36.57	-7.55
1	/LIVE LOAD	8.49	8.42	-5.68	-1.94
1	/X-SEISMIC	-4.96	-3.95	1.82	1.05
1	/Y-SEISMIC	-.21	-.17	.08	.05
2	/DEAD LOAD	17.28	-17.97	-200.66	.08
2	/LIVE LOAD	2.53	-2.96	-24.45	.05
2	/X-SEISMIC	-2774.13	1165.62	-.08	189.24
2	/Y-SEISMIC	-121.05	51.94	-.00	8.13
3	/DEAD LOAD	1.78	1.34	-71.91	-.37
3	/LIVE LOAD	.47	.51	-12.04	-.12
3	/X-SEISMIC	-7.51	-6.42	-.71	1.64
3	/Y-SEISMIC	-.32	-.28	-.03	.07
4	/DEAD LOAD	-35.21	-31.50	-37.37	7.85
4	/LIVE LOAD	-8.78	-8.68	-5.83	2.05
4	/X-SEISMIC	-3.55	-2.92	-1.02	.75
4	/Y-SEISMIC	-.15	-.12	-.04	.03

BEAM FORCES AT LEVEL ST-3 IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-74.53	89.52	43.43	-16.89	-18.21
1	/LIVE LOAD	-17.13	21.33	10.85	-3.81	-4.19
1	/X-SEISMIC	10.78	10.87	-.04	.95	-.95
1	/Y-SEISMIC	.47	.47	-.00	.04	-.04
2	/DEAD LOAD	-88.16	80.12	40.62	-17.91	-17.20
2	/LIVE LOAD	-20.61	19.17	9.71	-4.06	-3.94
2	/X-SEISMIC	10.60	10.16	.22	.92	-.92
2	/Y-SEISMIC	.46	.44	.01	.04	-.04
3	/DEAD LOAD	-85.33	78.42	42.81	-17.86	-17.25
3	/LIVE LOAD	-20.42	17.94	10.60	-4.11	-3.89
3	/X-SEISMIC	6.53	7.02	-.24	.60	-.60
3	/Y-SEISMIC	.28	.30	-.01	.03	-.03

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
.01	.00	0.00	0.00	192.67	8.28

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

COLUMN FORCES AT LEVEL ROOF IN FRAME A

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/DEAD LOAD	44.09	49.87	-17.03	-11.05
1	/LIVE LOAD	8.27	6.64	-1.87	-1.75
1	/X-SEISMIC	-5.89	-7.48	.86	1.57
1	/Y-SEISMIC	-.26	-.32	.04	.07
2	/DEAD LOAD	12.86	-16.25	-96.55	.40
2	/LIVE LOAD	.78	-1.08	-8.20	.04
2	/X-SEISMIC	-926.93	103.72	-.04	94.85
2	/Y-SEISMIC	-41.69	4.73	-.00	4.35
3	/DEAD LOAD	3.76	5.40	-34.21	-1.08
3	/LIVE LOAD	.68	.68	-3.99	-.16
3	/X-SEISMIC	-8.83	-10.32	-.39	2.25
3	/Y-SEISMIC	-.38	-.45	-.02	.10
4	/DEAD LOAD	-46.62	-53.28	-17.47	11.75
4	/LIVE LOAD	-8.76	-7.24	-1.94	1.88
4	/X-SEISMIC	-3.47	-4.22	-.42	.90
4	/Y-SEISMIC	-.15	-.18	-.02	.04

BEAM FORCES AT LEVEL ROOF IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/DEAD LOAD	-56.89	83.46	42.52	-14.38	-16.72
1	/LIVE LOAD	-8.03	11.01	5.67	-1.87	-2.13
1	/X-SEISMIC	9.26	10.29	-.51	.96	-.86
1	/Y-SEISMIC	.40	.44	-.02	.04	-.04
2	/DEAD LOAD	-77.85	71.40	35.37	-15.83	-15.27
2	/LIVE LOAD	-10.71	9.23	4.96	-2.07	-1.93
2	/X-SEISMIC	9.98	8.55	.72	.82	-.82
2	/Y-SEISMIC	.43	.37	.03	.04	-.04
3	/DEAD LOAD	-77.73	61.06	41.62	-16.29	-14.81
3	/LIVE LOAD	-10.07	8.77	5.48	-2.06	-1.94
3	/X-SEISMIC	4.32	5.29	-.49	.42	-.42
3	/Y-SEISMIC	.19	.23	-.02	.02	-.02

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
.02	.00	0.00	0.00	101.58	4.55

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

SUMMARY OF STORY SHEAR DISTRIBUTION
STORY-BY-STORY / FRAME-BY-FRAME

LEVEL ID	/--FRAME LOCATION--/	I	II	III	IV	A	B
ST-1	FRAME A	.00	.00	0.00	0.00	289.63	12.20
	FRAME C	.00	.00	0.00	0.00	[illegible]	-12.20
	FRAME B	-.00	-.00	0.00	0.00	3.90	0.00
	FRAME 1	.05	.01	0.00	0.00	24.23	276.79
	FRAME 5	.05	.01	0.00	0.00	-24.23	324.75
	FRAME 2	-.03	-.01	0.00	0.00	.09	2.09
	FRAME 3	-.03	-.01	0.00	0.00	0.00	2.18
	FRAME 4	-.03	-.01	0.00	0.00	-.09	2.27
ST-2	FRAME A	.01	.00	0.00	0.00	254.95	10.84
	FRAME C	.01	.00	0.00	0.00	276.63	-10.84
	FRAME B	-.02	-.00	0.00	0.00	5.44	0.00
	FRAME 1	.20	.03	0.00	0.00	21.37	242.88
	FRAME 5	.20	.03	0.00	0.00	-21.37	265.62
	FRAME 2	-.14	-.02	0.00	0.00	.12	2.73
	FRAME 3	-.14	-.02	0.00	0.00	0.00	2.84
	FRAME 4	-.14	-.02	0.00	0.00	-.12	2.96
ST-3	FRAME A	.01	.00	0.00	0.00	192.67	8.28
	FRAME C	.01	.00	0.00	0.00	209.23	-8.28
	FRAME B	-.03	-.00	0.00	0.00	5.78	0.00
	FRAME 1	.27	.04	0.00	0.00	16.18	163.10
	FRAME 5	.27	.04	0.00	0.00	-16.18	215.47
	FRAME 2	-.18	-.03	0.00	0.00	.12	2.92
	FRAME 3	-.18	-.03	0.00	0.00	0.00	3.04
	FRAME 4	-.18	-.03	0.00	0.00	-.12	3.16
ROOF	FRAME A	.02	.00	0.00	0.00	101.58	4.55
	FRAME C	.02	.00	0.00	0.00	110.69	-4.55
	FRAME B	-.04	-.01	0.00	0.00	7.29	0.00
	FRAME 1	.44	.07	0.00	0.00	8.62	95.35
	FRAME 5	.44	.07	0.00	0.00	-8.62	112.59
	FRAME 2	-.29	-.05	0.00	0.00	.16	3.71
	FRAME 3	-.29	-.05	0.00	0.00	0.00	3.87
	FRAME 4	-.29	-.05	0.00	0.00	-.16	4.03

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

COLUMN STRESSES AT LEVEL ST-1 IN FRAME 4

COLUMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	238.69	405.34	-318.75	-16.32
1	/LIVE LOAD	52.16	98.81	-54.56	-3.97
1	/X-SEISMIC	3.95	.85	-.35	-.12
1	/Y-SEISMIC	-101.63	-22.18	9.03	3.14
2	/DEAD LOAD	2.67	.42	-594.21	-.08
2	/LIVE LOAD	.44	.07	-107.55	-.01
2	/X-SEISMIC	4.66	2.08	-.00	-.17
2	/Y-SEISMIC	-120.00	-53.71	.00	4.40
3	/DEAD LOAD	-234.46	-406.40	-317.75	16.24
3	/LIVE LOAD	-51.47	-88.98	-54.40	3.56
3	/X-SEISMIC	3.95	.85	.35	-.12
3	/Y-SEISMIC	-101.63	-22.18	-9.03	3.14

BEAM STRESSES AT LEVEL ST-1 IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-885.95	1122.78	752.36	-89.75	-96.02
1	/LIVE LOAD	-191.06	244.51	163.37	-19.44	-20.86
1	/X-SEISMIC	-4.19	-3.89	-.15	-.11	.11
1	/Y-SEISMIC	107.65	99.97	3.84	2.75	-2.75
2	/DEAD LOAD	-1129.75	878.52	752.84	-96.21	-89.56
2	/LIVE LOAD	-245.66	189.84	163.45	-20.89	-19.41
2	/X-SEISMIC	-3.89	-4.19	.15	-.11	.11
2	/Y-SEISMIC	99.97	107.65	-3.84	2.75	-2.75

/TABS80 /SAMPLE EXAMPLE 1
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL

COLUMN STRESSES AT LEVEL ST-2 IN FRAME 4

COLUMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	651.26	528.84	-236.30	-36.93
1	/LIVE LOAD	139.09	110.20	-39.15	-7.80
1	/X-SEISMIC	2.69	1.73	-.28	-.14
1	/Y-SEISMIC	-68.91	-44.44	7.09	3.55
2	/DEAD LOAD	6.21	3.60	-439.35	-.31
2	/LIVE LOAD	1.02	.61	-76.77	-.05
2	/X-SEISMIC	4.85	3.66	-.00	-.27
2	/Y-SEISMIC	-124.34	-94.05	.00	6.83
3	/DEAD LOAD	-643.14	-526.26	-235.44	36.60
3	/LIVE LOAD	-137.75	-109.74	-39.01	7.74
3	/X-SEISMIC	2.69	1.73	.28	-.14
3	/Y-SEISMIC	-68.91	-44.44	-7.09	3.55

BEAM STRESSES AT LEVEL ST-2 IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-964.87	1075.36	735.05	-91.42	-94.35
1	/LIVE LOAD	-209.86	233.71	159.00	-19.84	-20.47
1	/X-SEISMIC	-5.19	-4.92	-.14	-.13	.13
1	/Y-SEISMIC	132.93	125.97	3.48	3.43	-3.43
2	/DEAD LOAD	-1088.12	951.37	735.66	-94.69	-91.07
2	/LIVE LOAD	-235.77	207.68	159.09	-20.52	-19.78
2	/X-SEISMIC	-4.92	-5.19	.14	-.13	.13
2	/Y-SEISMIC	125.97	132.93	-3.48	3.43	-3.43

COLUMN STRESSES AT LEVEL ST-3 IN FRAME 4

COLUMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	490.54	436.21	-154.75	-29.00
1	/LIVE LOAD	112.66	110.87	-23.48	-7.00
1	/X-SEISMIC	2.73	2.12	-.18	-.15
1	/Y-SEISMIC	-69.95	-54.63	4.67	3.90
2	/DEAD LOAD	7.60	5.31	-288.82	-.40
2	/LIVE LOAD	1.20	.84	-46.14	-.06
2	/X-SEISMIC	4.80	4.06	.00	-.28
2	/Y-SEISMIC	-122.88	-104.13	-.00	7.10
3	/DEAD LOAD	-481.35	-431.48	-154.14	28.57
3	/LIVE LOAD	-111.23	-110.12	-23.36	6.93
3	/X-SEISMIC	2.73	2.12	.18	-.15
3	/Y-SEISMIC	-69.95	-54.63	-4.67	3.90

BEAM STRESSES AT LEVEL ST-3 IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-990.05	1057.11	731.32	-92.00	-93.77
1	/LIVE LOAD	-205.72	234.77	160.58	-19.77	-20.54
1	/X-SEISMIC	-5.69	-5.41	-.14	-.15	.15
1	/Y-SEISMIC	145.44	138.23	3.60	3.75	-3.75
2	/DEAD LOAD	-1074.43	971.84	731.98	-94.24	-91.53
2	/LIVE LOAD	-237.53	202.82	160.71	-20.61	-19.69
2	/X-SEISMIC	-5.41	-5.69	.14	-.15	.15
2	/Y-SEISMIC	138.23	145.44	-3.60	3.75	-3.75

COLUMN STRESSES AT LEVEL ROOF IN FRAME 4

COLUMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	653.17	749.29	-72.80	-43.89
1	/LIVE LOAD	112.43	93.36	-7.82	-6.44
1	/X-SEISMIC	2.77	3.40	-.08	-.19
1	/Y-SEISMIC	-70.44	-86.78	2.02	4.92
2	/DEAD LOAD	9.97	10.70	-139.01	-.65
2	/LIVE LOAD	1.60	1.71	-15.34	-.10
2	/X-SEISMIC	5.35	6.13	.00	-.36
2	/Y-SEISMIC	-136.12	-156.26	-.00	9.15
3	/DEAD LOAD	-641.94	-737.50	-72.52	43.17
3	/LIVE LOAD	-110.62	-91.47	-7.78	6.32
3	/X-SEISMIC	2.77	3.40	.08	-.19
3	/Y-SEISMIC	-70.44	-86.78	-2.02	4.92

BEAM STRESSES AT LEVEL ROOF IN FRAME 4

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-760.30	1008.98	694.10	-80.15	-86.73
1	/LIVE LOAD	-101.08	115.60	82.07	-9.88	-10.27
1	/X-SEISMIC	-4.45	-4.01	-.22	-.11	.11
1	/Y-SEISMIC	113.42	102.34	5.54	2.86	-2.86
2	/DEAD LOAD	-1023.10	744.60	695.51	-87.12	-79.75
2	/LIVE LOAD	-117.86	98.57	82.25	-10.33	-9.82
2	/X-SEISMIC	-4.01	-4.45	.22	-.11	.11
2	/Y-SEISMIC	102.34	113.42	-5.54	2.86	-2.86

COLUMN STRESSES AT LEVEL ST-1 IN FRAME A

COLMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	290.31	511.51	-297.92	-20.52
1	/LIVE LOAD	70.95	121.68	-52.26	-4.88
1	/X-SEISMIC	-98.96	-30.50	12.83	3.28
1	/Y-SEISMIC	-4.19	-1.28	.55	.14
2	/DEAD LOAD	2.26	-2.41	-114.18	.08
2	/LIVE LOAD	.44	-.48	-15.60	.02
2	/X-SEISMIC	-563.20	367.22	-.04	94.55
2	/Y-SEISMIC	-24.06	15.80	-.00	3.98
3	/DEAD LOAD	23.22	39.55	-583.66	-1.59
3	/LIVE LOAD	5.59	9.54	-110.81	-.38
3	/X-SEISMIC	-114.22	-56.68	-4.33	4.33
3	/Y-SEISMIC	-4.84	-2.39	-.19	.18
4	/DEAD LOAD	-305.72	-524.78	-303.06	21.04
4	/LIVE LOAD	-72.59	-124.60	-53.27	5.00
4	/X-SEISMIC	-93.04	-20.34	-7.88	2.87
4	/Y-SEISMIC	-3.94	-.84	-.34	.12

BEAM STRESSES AT LEVEL ST-1 IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-1175.08	1569.84	969.03	-92.28	-102.73
1	/LIVE LOAD	-278.44	371.41	234.81	-20.99	-23.45
1	/X-SEISMIC	131.91	125.71	3.10	3.41	-3.41
1	/Y-SEISMIC	5.64	5.38	.13	.15	-.15
2	/DEAD LOAD	-1464.91	1414.44	866.09	-98.17	-96.83
2	/LIVE LOAD	-345.56	336.29	204.04	-22.34	-22.10
2	/X-SEISMIC	120.25	120.06	.09	3.18	-3.18
2	/Y-SEISMIC	5.15	5.13	.01	.14	-.14
3	/DEAD LOAD	-1516.36	1215.74	960.22	-101.48	-93.52
3	/LIVE LOAD	-359.80	287.02	232.77	-23.19	-21.26
3	/X-SEISMIC	88.27	97.13	-4.43	2.45	-2.45
3	/Y-SEISMIC	3.76	4.14	-.19	.10	-.10

COLUMN STRESSES AT LEVEL ST-2 IN FRAME A

COLMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	808.83	652.94	-220.21	-45.74
1	/LIVE LOAD	188.16	148.24	-37.43	-10.53
1	/X-SEISMIC	-84.39	-63.81	10.42	4.64
1	/Y-SEISMIC	-3.64	-2.73	.45	.20
2	/DEAD LOAD	1.39	-1.59	-83.54	.12
2	/LIVE LOAD	.23	-.27	-11.14	.03
2	/X-SEISMIC	-341.06	202.10	-.03	82.82
2	/Y-SEISMIC	-14.70	8.79	-.00	3.52
3	/DEAD LOAD	58.79	43.79	-431.02	-3.21
3	/LIVE LOAD	13.09	8.77	-78.81	-.68
3	/X-SEISMIC	-130.10	-104.48	-3.82	7.34
3	/Y-SEISMIC	-5.59	-4.47	-.18	.31
4	/DEAD LOAD	-834.11	-678.02	-224.48	47.32
4	/LIVE LOAD	-193.36	-153.11	-38.25	10.84
4	/X-SEISMIC	-61.56	-39.49	-6.15	3.16
4	/Y-SEISMIC	-2.66	-1.68	-.27	.14

BEAM STRESSES AT LEVEL ST-2 IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-1249.28	1537.54	931.17	-93.69	-101.32
1	/LIVE LOAD	-299.18	362.03	223.82	-21.39	-23.05
1	/X-SEISMIC	175.59	176.22	-.32	4.66	-4.66
1	/Y-SEISMIC	7.54	7.57	-.02	.20	-.20
2	/DEAD LOAD	-1493.03	1381.72	870.69	-98.98	-96.03
2	/LIVE LOAD	-351.63	328.76	207.17	-22.52	-21.92
2	/X-SEISMIC	171.90	165.60	3.15	4.47	-4.47
2	/Y-SEISMIC	7.39	7.12	.14	.19	-.19
3	/DEAD LOAD	-1471.23	1306.77	922.48	-99.68	-95.33
3	/LIVE LOAD	-348.88	310.77	220.23	-22.73	-21.72
3	/X-SEISMIC	109.37	118.94	-4.78	3.02	-3.02
3	/Y-SEISMIC	4.69	5.11	-.21	.13	-.13

COLUMN STRESSES AT LEVEL ST-3 IN FRAME A

COLMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	599.66	537.38	-143.59	-35.56
1	/LIVE LOAD	150.43	149.05	-22.31	-9.37
1	/X-SEISMIC	-87.84	-69.93	7.13	4.94
1	/Y-SEISMIC	-3.79	-2.99	.31	.21
2	/DEAD LOAD	1.12	-1.17	-55.01	.03
2	/LIVE LOAD	.16	-.19	-6.70	.02
2	/X-SEISMIC	-180.15	75.70	-.02	62.26
2	/Y-SEISMIC	-7.86	3.37	-.00	2.68
3	/DEAD LOAD	31.44	23.82	-282.31	-1.73
3	/LIVE LOAD	8.32	9.02	-47.26	-.54
3	/X-SEISMIC	-132.98	-113.62	-2.80	7.72
3	/Y-SEISMIC	-5.73	-4.87	-.12	.33
4	/DEAD LOAD	-623.54	-557.80	-146.70	36.97
4	/LIVE LOAD	-155.56	-153.79	-22.90	9.68
4	/X-SEISMIC	-62.83	-49.96	-4.01	3.53
4	/Y-SEISMIC	-2.71	-2.13	-.17	.15

BEAM STRESSES AT LEVEL ST-3 IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-1258.22	1535.87	926.13	-93.83	-101.18
1	/LIVE LOAD	-289.52	367.29	228.65	-21.19	-23.25
1	/X-SEISMIC	199.59	201.22	-.82	5.30	-5.30
1	/Y-SEISMIC	8.61	8.68	-.03	.23	-.23
2	/DEAD LOAD	-1510.74	1361.75	874.11	-99.47	-95.53
2	/LIVE LOAD	-353.84	327.14	207.56	-22.58	-21.87
2	/X-SEISMIC	196.38	188.19	4.09	5.09	-5.09
2	/Y-SEISMIC	8.47	8.12	.18	.22	-.22
3	/DEAD LOAD	-1458.35	1330.29	914.68	-99.20	-95.81
3	/LIVE LOAD	-350.31	304.36	224.10	-22.83	-21.61
3	/X-SEISMIC	120.92	129.96	-4.52	3.32	-3.32
3	/Y-SEISMIC	5.22	5.61	-.20	.14	-.14

COLUMN STRESSES AT LEVEL ROOF IN FRAME A

COLMN NO	LOAD IDENTIFICATION	BOT-BEND STRESS	TOP-BEND STRESS	AXIAL STRESS	SHEAR STRESS
1	/DEAD LOAD	790.87	883.24	-66.86	-52.08
1	/LIVE LOAD	146.49	117.64	-7.34	-8.27
1	/X-SEISMIC	-104.34	-132.45	3.39	7.41
1	/Y-SEISMIC	-4.54	-5.73	.15	.32
2	/DEAD LOAD	.83	-1.06	-26.47	.13
2	/LIVE LOAD	.05	-.07	-2.25	.01
2	/X-SEISMIC	-60.20	6.74	-.01	31.86
2	/Y-SEISMIC	-2.71	.31	-.00	1.43
3	/DEAD LOAD	66.59	95.62	-134.28	-5.08
3	/LIVE LOAD	12.12	12.06	-15.87	-.76
3	/X-SEISMIC	-156.31	-182.74	-1.55	10.61
3	/Y-SEISMIC	-6.79	-7.91	-.07	.46
4	/DEAD LOAD	-825.64	-943.61	-68.58	55.37
4	/LIVE LOAD	-155.09	-128.27	-7.63	8.87
4	/X-SEISMIC	-61.47	-74.70	-1.66	4.26
4	/Y-SEISMIC	-2.69	-3.24	-.07	.19

BEAM STRESSES AT LEVEL ROOF IN FRAME A

BEAM NO	LOAD IDENTIFICATION	LT-BEND STRESS	RT-BEND STRESS	SP-BEND STRESS	LT-SHEAR STRESS	RT-SHEAR STRESS
1	/DEAD LOAD	-945.54	1437.51	895.45	-79.88	-92.90
1	/LIVE LOAD	-134.84	190.09	118.95	-10.38	-11.84
1	/X-SEISMIC	171.56	190.56	-9.50	4.79	-4.79
1	/Y-SEISMIC	7.43	8.24	-.41	.21	-.21
2	/DEAD LOAD	-1333.65	1214.17	762.52	-87.97	-84.81
2	/LIVE LOAD	-184.52	157.08	105.71	-11.47	-10.75
2	/X-SEISMIC	184.89	158.37	13.26	4.54	-4.54
2	/Y-SEISMIC	7.99	6.85	.57	.20	-.20
3	/DEAD LOAD	-1331.53	1022.69	878.67	-90.48	-82.30
3	/LIVE LOAD	-172.64	148.59	115.29	-11.43	-10.79
3	/X-SEISMIC	79.98	98.01	-9.02	2.36	-2.36
3	/Y-SEISMIC	3.47	4.25	-.39	.10	-.10

```
/TABS80 /SAMPLE EXAMPLE 1                                        PAGE   37
/STATIC ANALYSIS /VERTICAL AND UBC LATERAL                        06/08/80

TIME LOG (SECONDS)

FORM FRAME STIFFNESSES................ =     .82
SOLVE STATIC LOAD CASES............... =     .03
MODE SHAPES AND FREQUENCIES........... =     .17
COMPUTE FRAME DISPLACEMENTS........... =     .00
MEMBER FORCES AND STRESSES............ =    2.11

TOTAL TIME............................ =    3.13
```

B. Example 2

(i) Description

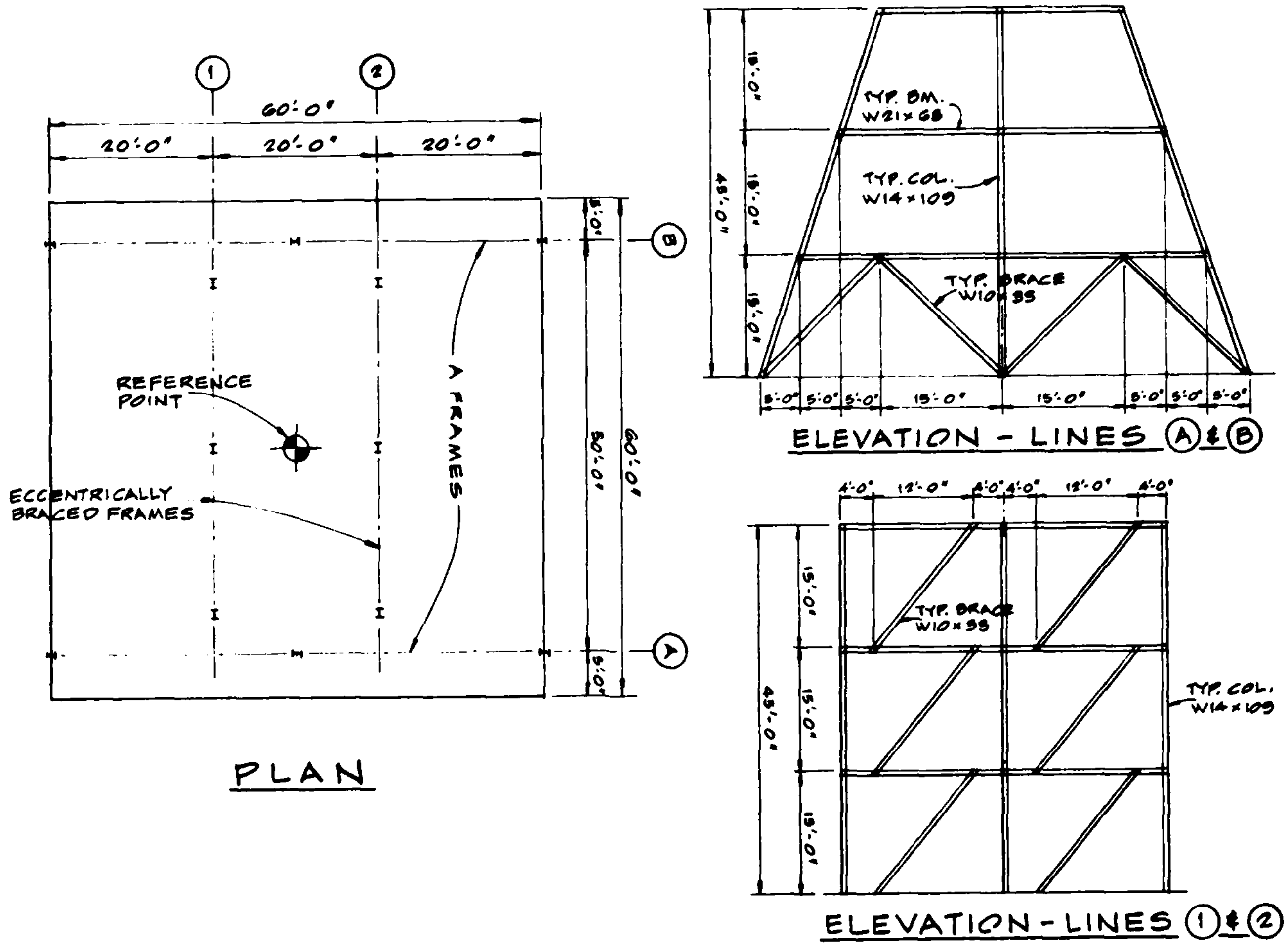
This is a three story structure laterally braced with eccentrically braced frames in one direction and A-frames in the other direction. A lateral static wind load analysis of wind acting in two directions independently is implemented.

(ii) Significant options of CTABS80 activated

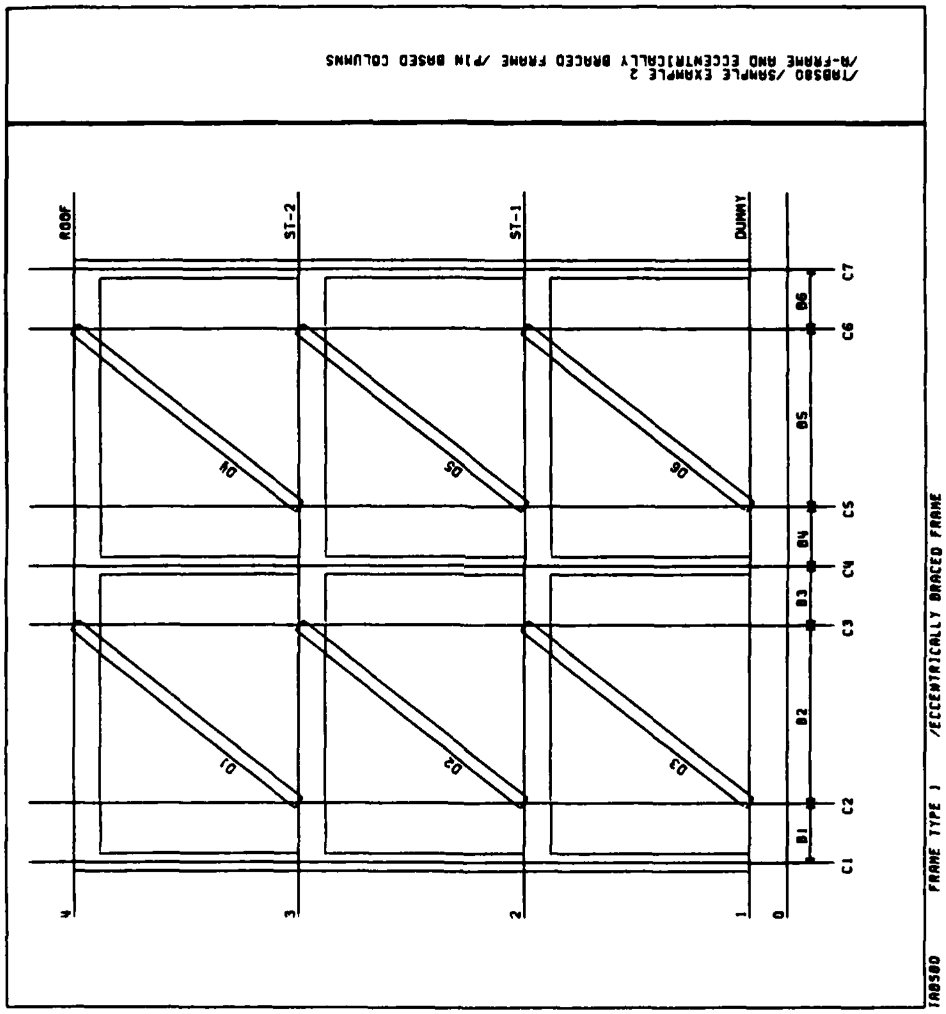
1. Bending diagonal element usage
2. Pin base modeling
3. Plotting
4. Static lateral load analysis

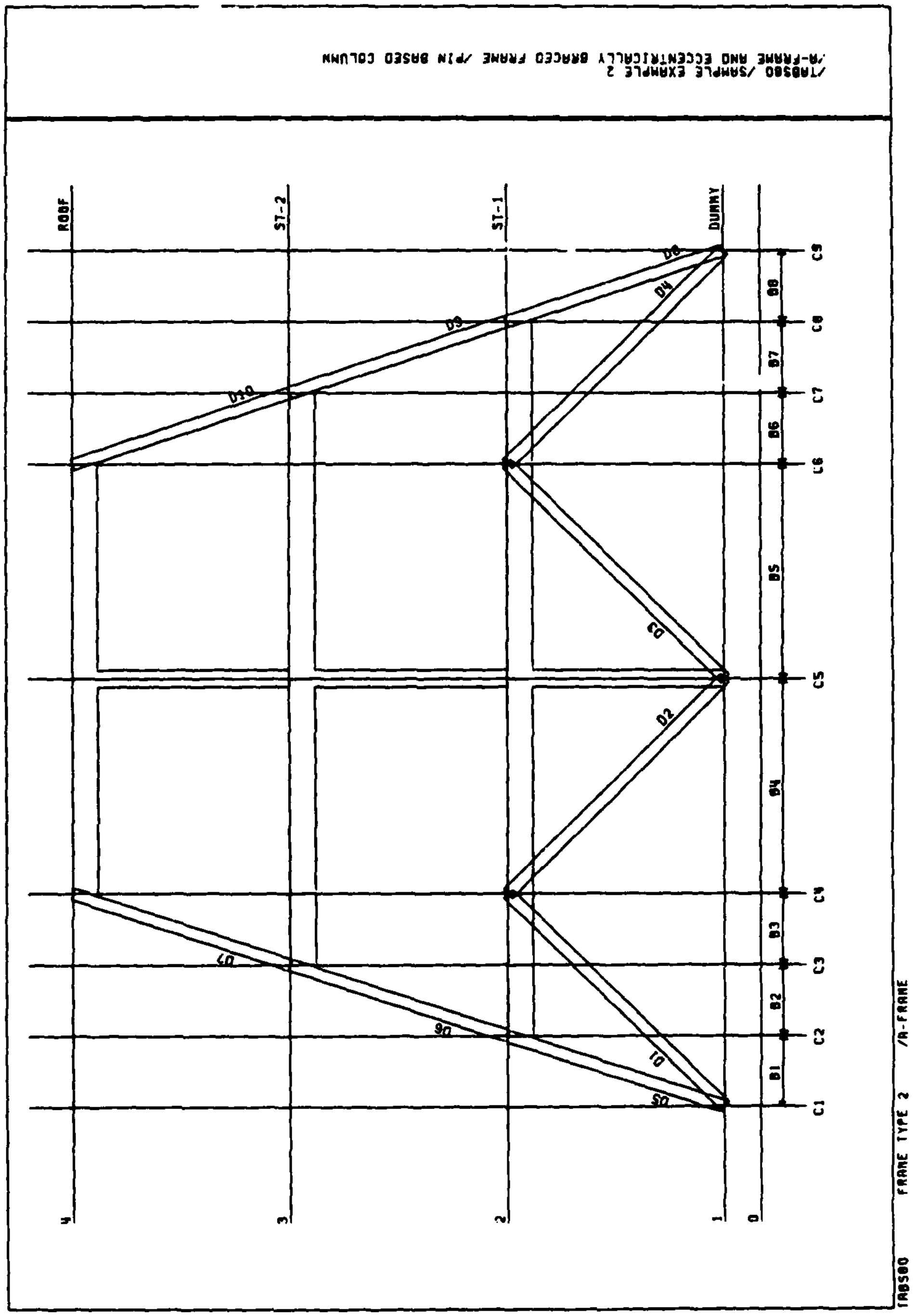
(iii) Comments

This example illustrates how the new diagonal element can be used to effectively model complex situations. Bending stiffness of the diagonal element allows inclined members to participate in the sturctural frame action.

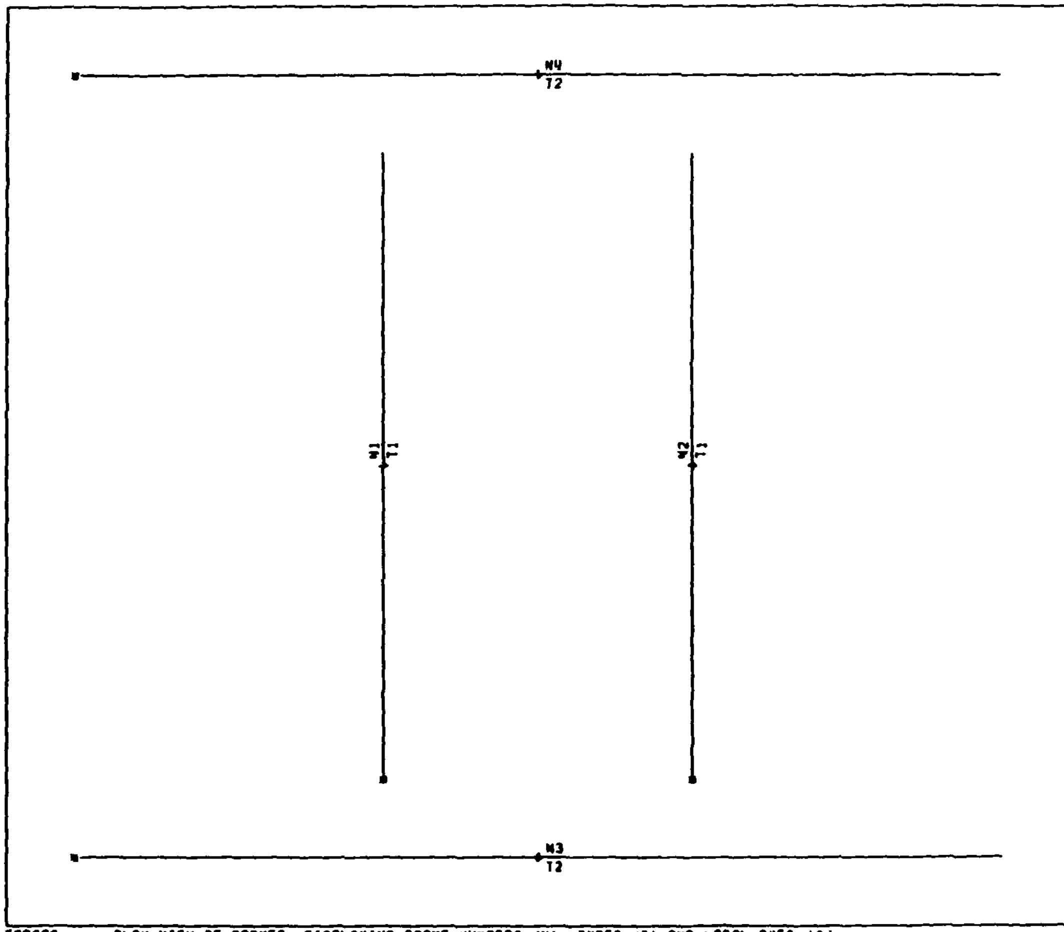

60'-0"
20'-0"
20'-0"
20'-0"
5'-0"
50'-0"
60'-0"
5'-0"
REFERENCE POINT
ECCENTRICALLY BRACED FRAMES
A FRAMES
PLAN
TYP. BM. W21×68
TYP. COL. W14×109
TYP. BRACE W10×35
45'-0"
15'-0"
15'-0"
15'-0"
5'-0"
5'-0"
5'-0"
15'-0"
15'-0"
5'-0"
5'-0"
5'-0"
ELEVATION - LINES A & B
4'-0"
12'-0"
4'-0"
4'-0"
12'-0"
4'-0"
TYP. BRACE W10×35
TYP. COL. W14×109
45'-0"
15'-0"
15'-0"
15'-0"
ELEVATION - LINES 1 & 2

EXAMPLE 2


/TABS80 /SAMPLE EXAMPLE 2
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS
ROOF
ST-2
ST-1
DUMMY
4
3
2
1
0
C1
C2
C3
C4
C5
C6
C7
B1
B2
B3
B4
B5
B6
D1
D2
D3
D4
D5
D6
TABS80
FRAME TYPE 1
/ECCENTRICALLY BRACED FRAME


/TABS80 /SAMPLE EXAMPLE 2
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMN
ROOF
ST-2
ST-1
DUMMY
4
3
2
1
0
C1
C2
C3
C4
C5
C6
C7
C8
C9
B1
B2
B3
B4
B5
B6
B7
B8
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
FRAME TYPE 2 /A-FRAME
TABS80

/TABS80 /SAMPLE EXAMPLE 2
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS



TABS80 PLAN VIEW OF FRAMES. DISPLAYING FRAME NUMBERS (N), TYPES (T) AND LOCAL AXES (+)

/TABS80 /SAMPLE EXAMPLE 2 PAGE 1
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 06/06/80

TOTAL NUMBER OF STORIES IN STRUCTURE--------	4
NUMBER OF DIFFERENT FRAMES IN STRUCTURE-----	2
TOTAL NUMBER OF FRAMES IN STRUCTURE---------	4
TOTAL NUMBER OF STRUCTURAL LOAD CASES-------	2
TYPE OF ANALYSIS----------------------------	0
NUMBER OF MODES CONSIDERED------------------	0
LATERAL STORY TRANSLATION CODE--------------	0
EXECUTION MODE------------------------------	0
FRAME JOINT RIGID ZONE MODIFICATION CODE----	0
FRAME JOINT DISPLACEMENT PRINT FLAG---------	0
UBC LATERAL SEISMIC FORCE CODE--------------	0
NUMBER OF STORY MASS PATTERNS---------------	0
MASTER PEN PLOT FLAG------------------------	1

CONVERSION DATA FOR STRESSES

LENGTH CONVERSION FACTOR--------------------	1.000
FORCE CONVERSION FACTOR--------------------	1.000

/TABS80 /SAMPLE EXAMPLE 2 PAGE 2
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 06/06/80

STRUCTURAL STORY DATA . . .

LEVEL	MASS TYPE	HEIGHT	K-X	K-Y	K-ROTN
ROOF	0	180.00	0.	0.	0.
ST-2	0	180.00	0.	0.	0.
ST-1	0	180.00	0.	0.	0.
DUMMY	0	30.00	1.0000E+10	1.0000E+10	1.0000E+10

STRUCTURAL MASS DATA . . .

LEVEL	MASS	MMI	XM	YM
ROOF	0.000	0.0	0.00	0.00
ST-2	0.000	0.0	0.00	0.00
ST-1	0.000	0.0	0.00	0.00
DUMMY	0.000	0.0	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION A . . .

LEVEL	FX	FY	X	Y
ROOF	30.00	0.00	0.00	0.00
ST-2	20.00	0.00	0.00	0.00
ST-1	20.00	0.00	0.00	0.00
DUMMY	0.00	0.00	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION B . . .

LEVEL	FX	FY	X	Y
ROOF	0.00	30.00	0.00	0.00
ST-2	0.00	20.00	0.00	0.00
ST-1	0.00	20.00	0.00	0.00
DUMMY	0.00	0.00	0.00	0.00

/ECCENTRICALLY BRACED FRAME

FRAME IDENTIFICATION NUMBER------------------	1
NUMBER OF COLUMN LINES IN FRAME--------------	7
NUMBER OF STORY LEVELS IN FRAME--------------	4
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	3
NUMBER OF BEAM PROPERTIES--------------------	1
NUMBER OF BEAM SPAN LOADING PATTERNS---------	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----	0
NUMBER OF PANEL ELEMENTS IN FRAME-----------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------	6
FRAME PEN PLOT FLAG-------------------------	0
STORY CONNECTIVITY CODE---------------------	0

BAY WIDTHS

48.00	144.00	48.00	48.00	144.00	48.00

SILL DEPTHS

0.0C	0.00	C.00	0.00	0.00	0.00

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	W	T
1	0.000	29500.0	.100E+07	0.	0.00	0.00	0.00
2	0.000	29500.0	.971E+01	.171E+03	2.82	9.98	0.00
3	0.000	29500.0	.320E+02	.124E+04	7.52	14.32	0.00

BEAM SECTION PROPERTY DATA

ID	U	E	I	K	C	DB	DA	AV	T
1	0.000	29500.0	.148E+04	4.00	.50	21.13	0.00	9.09	0.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3	4	5	6	7
ROOF	3	0	0	3	0	0	3
ST-2	3	0	0	3	0	0	3
ST-1	3	0	0	3	0	0	3
DUMMY	1	1	1	1	1	1	1

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2	3	4	5	6
ROOF	1	1	1	1	1	1

LEVEL	1	2	3	4	5	6
ST-2	1	1	1	1	1	1
ST-1	1	1	1	1	1	1
DUMMY	0	0	0	0	0	0

INPUT AND/OR GENERATED DIAGONAL DATA

DIAGONAL ID	LEVEL AT TOP	LOWER COLUMN	UPPER COLUMN	COLUMN PROP ID
1	4	2	3	2
2	3	2	3	2
3	2	2	3	2
4	4	5	6	2
5	3	5	6	2
6	2	5	6	2

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	---------VERTICAL LOAD COND---------/ I	II	III	IV
ROOF	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00
DUMMY	0.00	0.00	0.00	0.00

FRAME NO.= 1
TIME = .14

/A-FRAME

FRAME IDENTIFICATION NUMBER------------------	2
NUMBER OF COLUMN LINES IN FRAME-------------	9
NUMBER OF STORY LEVELS IN FRAME-------------	4
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	3
NUMBER OF BEAM PROPERTIES-------------------	1
NUMBER OF BEAM SPAN LOADING PATTERNS--------	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----	0
NUMBER OF PANEL ELEMENTS IN FRAME-----------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------	10
FRAME PEN PLOT FLAG-------------------------	0
STORY CONNECTIVITY CODE---------------------	0

BAY WIDTHS

60.00	60.00	60.00	180.00	180.00	60.00	60.00
60.00						

SILL DEPTHS

0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00						

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	W	T
1	0.000	29500.0	.100E+07	0.	0.00	0.00	0.00
2	0.000	29500.0	.971E+01	.171E+03	2.82	9.98	0.00
3	0.000	29500.0	.320E+02	.124E+04	7.52	14.32	0.00

BEAM SECTION PROPERTY DATA

ID	U	E	I	K	C	DB	DA	AV	T
1	0.000	29500.0	.148E+04	4.00	.50	21.13	0.00	9.09	0.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3	4	5	6	7	8	9
ROOF	0	0	0	0	3	0	0	0	0
ST-2	0	0	0	0	3	0	0	0	0
ST-1	0	0	0	0	3	0	0	0	0
DUMMY	1	0	0	0	1	0	0	0	1

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2	3	4	5	6	7	8
ROOF	0	0	0	1	1	0	0	0
ST-2	0	0	1	1	1	1	0	0
ST-1	0	1	1	1	1	1	1	0
DUMMY	0	0	0	0	0	0	0	0

INPUT AND/OR GENERATED DIAGONAL DATA

DIAGONAL ID	LEVEL AT TOP	LOWER COLUMN	UPPER COLUMN	COLUMN PROP ID
1	2	1	4	2
2	2	5	4	2
3	2	5	6	2
4	2	9	6	2
5	2	1	2	2
6	3	2	3	2
7	4	3	4	2
8	2	9	8	2
9	3	8	7	2
10	4	7	6	2

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	---------VERTICAL LOAD COND--------/ I	II	III	IV
ROOF	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00
DUMMY	0.00	0.00	0.00	0.00

FRAME NO.= 2
TIME = .16

/TABS80 /SAMPLE EXAMPLE 2 PAGE 7
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 06/06/80

FRAME LOCATION DATA

FRAME NC	FRAME TYPE	PRINT CODE	X1	Y1	X2	Y2	/--FRAME LOCATION--/
1	1	1	-120.00	-240.00	-120.00	240.00	/E-FRAME AT LINE 1
2	1	0	120.00	-240.00	120.00	240.00	/E-FRAME AT LINE 2
3	2	1	-360.00	-300.00	360.00	-300.00	/A-FRAME AT LINE A
4	2	0	-360.00	300.00	360.00	300.00	/A-FRAME AT LINE B

/TABS80 /SAMPLE EXAMPLE 2 PAGE 8
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

STATIC LOAD CONDITION DISPLACEMENTS

DISPLACEMENTS ARE AT THE CENTERS OF MASS OF THE RESPECTIVE LEVELS

LEVEL	DIRN	I	II	III	IV	A	B
ROOF	X	0.00000	0.00000	0.00000	0.00000	.43658	0.00000
ROOF	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.11558
ROOF	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ST-2	X	0.00000	0.00000	0.00000	0.00000	.29208	0.00000
ST-2	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.08936
ST-2	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
ST-1	X	0.00000	0.00000	0.00000	0.00000	.01341	0.00000
ST-1	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.05398
ST-1	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
DUMMY	X	0.00000	0.00000	0.00000	0.00000	.00000	0.00000
DUMMY	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.00000
DUMMY	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

(Columns I–B are under /--------LOAD CONDITIONS--------/)

/TABS80 /SAMPLE EXAMPLE 2 PAGE 9
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

LOAD CASE DEFINITION DATA

NO	IC	I	II	III	IV	A	B	DYN-1	DYN-2	DYN-3	LOAD CASE ID
1	0	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	/WIND-X
2	0	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	/WIND-Y

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS MODAL COMBINATION
DYNAMIC 3 . . . CQC MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

/TABS80 /SAMPLE EXAMPLE 2 PAGE 10
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

LATERAL FRAME DISPLACEMENTS IN /A-FRAME AT LINE B

LEVEL	/WIND-X	/WIND-Y
ROOF	.436582	0.000000
ST-2	.292077	0.000000
ST-1	.013408	0.000000
DUMMY	.000000	0.000000

/TABS80 /SAMPLE EXAMPLE 2 PAGE 11
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

COLUMN FORCES AT LEVEL DUMMY IN /A-FRAME AT LINE B

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/WIND-X	0.00	0.00	18.75	0.00
1	/WIND-Y	0.00	0.00	0.00	0.00
5	/WIND-X	0.00	0.00	.00	0.00
5	/WIND-Y	0.00	0.00	0.00	0.00
9	/WIND-X	0.00	0.00	-18.75	0.00
9	/WIND-Y	0.00	0.00	0.00	0.00

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	0.00

/TABS80 /SAMPLE EXAMPLE 2 PAGE 12
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

COLUMN FORCES AT LEVEL ST-1 IN /A-FRAME AT LINE B

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/WIND-X	39.12	318.29	.00	-2.25
5	/WIND-Y	0.00	0.00	0.00	0.00

BEAM FORCES AT LEVEL ST-1 IN /A-FRAME AT LINE B

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
2	/WIND-X	205.25	-132.22	168.74	1.22	-1.22
2	/WIND-Y	0.00	0.00	0.00	0.00	0.00
3	/WIND-X	132.22	-59.19	95.70	1.22	-1.22
3	/WIND-Y	0.00	0.00	0.00	0.00	0.00
4	/WIND-X	90.40	383.52	-146.56	2.74	-2.74
4	/WIND-Y	0.00	0.00	0.00	0.00	0.00
5	/WIND-X	383.52	90.40	146.56	2.74	-2.74
5	/WIND-Y	0.00	0.00	0.00	0.00	0.00
6	/WIND-X	-59.19	132.22	-95.70	1.22	-1.22
6	/WIND-Y	0.00	0.00	0.00	0.00	0.00
7	/WIND-X	-132.22	205.25	-168.74	1.22	-1.22
7	/WIND-Y	0.00	0.00	0.00	0.00	0.00

DIAGONAL FORCES AT LEVEL ST-1 IN /A-FRAME AT LINE B

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/WIND-X	-5.97	-12.06	11.71	.07
1	/WIND-Y	0.00	0.00	0.00	0.00
2	/WIND-X	-19.56	-19.15	-9.63	.15
2	/WIND-Y	0.00	0.00	0.00	0.00
3	/WIND-X	-19.56	-19.15	9.63	.15
3	/WIND-Y	0.00	0.00	0.00	0.00
4	/WIND-X	-5.97	-12.06	-11.71	.07
4	/WIND-Y	0.00	0.00	0.00	0.00
5	/WIND-X	5.97	17.11	11.05	-.12
5	/WIND-Y	0.00	0.00	0.00	0.00

DIAGONAL FORCES AT LEVEL ST-1 IN /A-FRAME AT LINE B

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
8	/WIND-X	5.97	17.11	-11.05	-.12
8	/WIND-Y	0.00	0.00	0.00	0.00

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	35.00	0.00

COLUMN FORCES AT LEVEL ST-2 IN /A-FRAME AT LINE B

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/WIND-X	-1172.16	-980.53	-.00	13.55
5	/WIND-Y	0.00	0.00	0.00	0.00

BEAM FORCES AT LEVEL ST-2 IN /A-FRAME AT LINE B

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
3	/WIND-X	435.29	-114.44	274.86	5.35	-5.35
3	/WIND-Y	0.00	0.00	0.00	0.00	0.00
4	/WIND-X	114.44	809.83	-347.70	5.35	-5.35
4	/WIND-Y	0.00	0.00	0.00	0.00	0.00
5	/WIND-X	809.83	114.44	347.70	5.35	-5.35
5	/WIND-Y	0.00	0.00	0.00	0.00	0.00
6	/WIND-X	-114.44	435.29	-274.86	5.35	-5.35
6	/WIND-Y	0.00	0.00	0.00	0.00	0.00

DIAGONAL FORCES AT LEVEL ST-2 IN /A-FRAME AT LINE B

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
6	/WIND-X	-222.36	-249.83	10.64	2.49
6	/WIND-Y	0.00	0.00	0.00	0.00
9	/WIND-X	-222.36	-249.83	-10.64	2.49
9	/WIND-Y	0.00	0.00	0.00	0.00

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	25.00	0.00

PAGE 15
04/16/81

/TABS80 /SAMPLE EXAMPLE 2
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS

COLUMN FORCES AT LEVEL ROOF IN /A-FRAME AT LINE B

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/WIND-X	-429.39	-837.17	.00	7.97
5	/WIND-Y	0.00	0.00	0.00	0.00

BEAM FORCES AT LEVEL ROOF IN /A-FRAME AT LINE B

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
4	/WIND-X	209.57	474.48	-132.45	3.96	-3.96
4	/WIND-Y	0.00	0.00	0.00	0.00	0.00
5	/WIND-X	474.48	209.57	132.45	3.96	-3.96
5	/WIND-Y	0.00	0.00	0.00	0.00	0.00

DIAGONAL FORCES AT LEVEL ROOF IN /A-FRAME AT LINE B

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
7	/WIND-X	-185.46	-209.57	4.87	2.08
7	/WIND-Y	0.00	0.00	0.00	0.00
10	/WIND-X	-185.46	-209.57	-4.87	2.08
10	/WIND-Y	0.00	0.00	0.00	0.00

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	15.00	0.00

FRAME NO. = 1
STRESS TIPE= .29

PAGE 16
04/16/81

/TABS80 /SAMPLE EXAMPLE 2
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS

LATERAL FRAME DISPLACEMENTS IN /E-FRAME AT LINE 2

LEVEL	/WIND-X	/WIND-Y
ROOF	0.000000	.115583
ST-2	0.000000	.089358
ST-1	0.000000	.053977
DUMMY	0.000000	.000000

PAGE 17
04/16/81

/TABS80 /SAMPLE EXAMPLE 2
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS

COLUMN FORCES AT LEVEL DUMMY IN /E-FRAME AT LINE 2

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/WIND-X	0.00	0.00	0.00	0.00
1	/WIND-Y	0.00	0.00	13.06	0.00
2	/WIND-X	0.00	0.00	0.00	0.00
2	/WIND-Y	0.00	0.00	19.26	0.00
3	/WIND-X	0.00	0.00	0.00	0.00
3	/WIND-Y	0.00	0.00	0.00	0.00
4	/WIND-X	0.00	0.00	0.00	0.00
4	/WIND-Y	0.00	0.00	-20.16	0.00
5	/WIND-X	0.00	0.00	0.00	0.00
5	/WIND-Y	0.00	0.00	19.52	0.00
6	/WIND-X	0.00	0.00	0.00	0.00
6	/WIND-Y	0.00	0.00	0.00	0.00
7	/WIND-X	0.00	0.00	0.00	0.00
7	/WIND-Y	0.00	0.00	-31.68	0.00

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	0.00

COLUMN FORCES AT LEVEL ST-1 IN /E-FRAME AT LINE 2

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/WIND-X	0.00	0.00	0.00	0.00
1	/WIND-Y	-.00	-120.16	13.06	.76
4	/WIND-X	0.00	0.00	0.00	0.00
4	/WIND-Y	0.00	-253.54	-20.16	1.60
7	/WIND-X	0.00	0.00	0.00	0.00
7	/WIND-Y	-.00	-219.59	-31.68	1.38

BEAM FORCES AT LEVEL ST-1 IN /E-FRAME AT LINE 2

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/WIND-X	0.00	0.00	0.00	0.00	0.00
1	/WIND-Y	172.99	163.45	4.77	8.24	-8.24
2	/WIND-X	0.00	0.00	0.00	0.00	0.00
2	/WIND-Y	-150.52	-288.61	69.05	-3.05	3.05
3	/WIND-X	0.00	0.00	0.00	0.00	0.00
3	/WIND-Y	311.94	350.05	-19.06	16.21	-16.21
4	/WIND-X	0.00	0.00	0.00	0.00	0.00
4	/WIND-Y	56.91	241.13	-92.11	7.30	-7.30
5	/WIND-X	0.00	0.00	0.00	0.00	0.00
5	/WIND-Y	-221.94	-282.07	30.06	-3.50	3.50
6	/WIND-X	0.00	0.00	0.00	0.00	0.00
6	/WIND-Y	302.52	351.70	-24.59	16.02	-16.02

DIAGONAL FORCES AT LEVEL ST-1 IN /E-FRAME AT LINE 2

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
3	/WIND-X	0.00	0.00	0.00	0.00
3	/WIND-Y	-.00	-23.32	24.74	.10
6	/WIND-X	0.00	0.00	0.00	0.00
6	/WIND-Y	-.00	-20.46	25.07	.09

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	35.00

COLUMN FORCES AT LEVEL ST-2 IN /E-FRAME AT LINE 2

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/WIND-X	0.00	0.00	0.00	0.00
1	/WIND-Y	-95.83	-100.28	4.82	1.23
4	/WIND-X	0.00	0.00	0.00	0.00
4	/WIND-Y	-288.01	-237.81	-11.24	3.31
7	/WIND-X	0.00	0.00	0.00	0.00
7	/WIND-Y	-217.60	-162.16	-15.67	2.39

BEAM FORCES AT LEVEL ST-2 IN /E-FRAME AT LINE 2

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/WIND-X	0.00	0.00	0.00	0.00	0.00
1	/WIND-Y	120.74	85.65	17.55	5.05	-5.05
2	/WIND-X	0.00	0.00	0.00	0.00	0.00
2	/WIND-Y	-75.01	-145.66	35.33	-1.53	1.53
3	/WIND-X	0.00	0.00	0.00	0.00	0.00
3	/WIND-Y	164.76	233.64	-34.44	9.76	-9.76
4	/WIND-X	0.00	0.00	0.00	0.00	0.00
4	/WIND-Y	116.12	110.20	2.96	5.54	-5.54
5	/WIND-X	0.00	0.00	0.00	0.00	0.00
5	/WIND-Y	-92.98	-102.00	4.51	-1.35	1.35
6	/WIND-X	0.00	0.00	0.00	0.00	0.00
6	/WIND-Y	122.30	263.38	-70.54	9.44	-9.44

DIAGONAL FORCES AT LEVEL ST-2 IN /E-FRAME AT LINE 2

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
2	/WIND-X	0.00	0.00	0.00	0.00
2	/WIND-Y	-12.93	-19.10	14.57	.14
5	/WIND-X	0.00	0.00	0.00	0.00
5	/WIND-Y	-19.19	-20.30	13.96	.17

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	25.00

/TABS80 /SAMPLE EXAMPLE 2 PAGE 22
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

COLUMN FORCES AT LEVEL ROOF IN /E-FRAME AT LINE 2

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/WIND-X	0.00	0.00	0.00	0.00
1	/WIND-Y	-30.56	-13.83	-.23	.28
4	/WIND-X	0.00	0.00	0.00	0.00
4	/WIND-Y	-151.54	-141.11	-7.03	1.84
7	/WIND-X	0.00	0.00	0.00	0.00
7	/WIND-Y	-118.34	-158.30	-6.22	1.74

BEAM FORCES AT LEVEL ROOF IN /E-FRAME AT LINE 2

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/WIND-X	0.00	0.00	0.00	0.00	0.00
1	/WIND-Y	21.38	-30.76	26.07	-.23	.23
2	/WIND-X	0.00	0.00	0.00	0.00	0.00
2	/WIND-Y	30.76	-63.81	47.28	-.23	.23
3	/WIND-X	0.00	0.00	0.00	0.00	0.00
3	/WIND-Y	79.49	180.12	-50.31	6.36	-6.36
4	/WIND-X	0.00	0.00	0.00	0.00	0.00
4	/WIND-Y	-40.77	13.26	-27.02	-.67	.67
5	/WIND-X	0.00	0.00	0.00	0.00	0.00
5	/WIND-Y	-13.26	-83.77	35.26	-.67	.67
6	/WIND-X	0.00	0.00	0.00	0.00	0.00
6	/WIND-Y	103.56	150.54	-23.49	6.22	-6.22

DIAGONAL FORCES AT LEVEL ROOF IN /E-FRAME AT LINE 2

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/WIND-X	0.00	0.00	0.00	0.00
1	/WIND-Y	-10.64	-15.68	8.5[illegible]	.11
4	/WIND-X	0.00	0.00	0.00	0.00
4	/WIND-Y	-17.22	-19.79	8.96	.16

STORY SHEAR	/--------LOAD CONDITIONS--------/					
	I	II	III	IV	A	B
	0.00	0.00	0.00	0.00	0.00	15.00

FRAME NO. = 3
STRESS TIME= .29

/TABS80 /SAMPLE EXAMPLE 2 PAGE 24
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

SUMMARY OF STORY SHEAR DISTRIBUTION
STORY-BY-STORY / FRAME-BY-FRAME

LEVEL ID	/--FRAME LOCATION--/	/--------LOAD CONDITIONS--------/					
		I	II	III	IV	A	B
DUMMY							
	/E-FRAME AT LINE 2	0.00	0.00	0.00	0.00	0.00	0.00
	/A-FRAME AT LINE 8	0.00	0.00	0.00	0.00	0.00	0.00
ST-1							
	/E-FRAME AT LINE 2	0.00	0.00	0.00	0.00	0.00	35.00
	/A-FRAME AT LINE 8	0.00	0.00	0.00	0.00	35.00	0.00
ST-2							
	/E-FRAME AT LINE 2	0.00	0.00	0.00	0.00	0.00	25.00
	/A-FRAME AT LINE 8	0.00	0.00	0.00	0.00	25.00	0.00
ROOF							
	/E-FRAME AT LINE 2	0.00	0.00	0.00	0.00	0.00	15.00
	/A-FRAME AT LINE 8	0.00	0.00	0.00	0.00	15.00	0.00

/TABS80 /SAMPLE EXAMPLE 2 PAGE 25
/A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS 04/16/81

TIME LOG (SECONDS)

FORM FRAME STIFFNESSES................ = .32
SOLVE STATIC LOAD CASES................ = .02
MODE SHAPES AND FREQUENCIES............ = .02
COMPUTE FRAME DISPLACEMENTS............ = .00
MEMBER FORCES AND STRESSES............. = .61

TOTAL TIME............................. = .98

C. Example 3

(i) Description

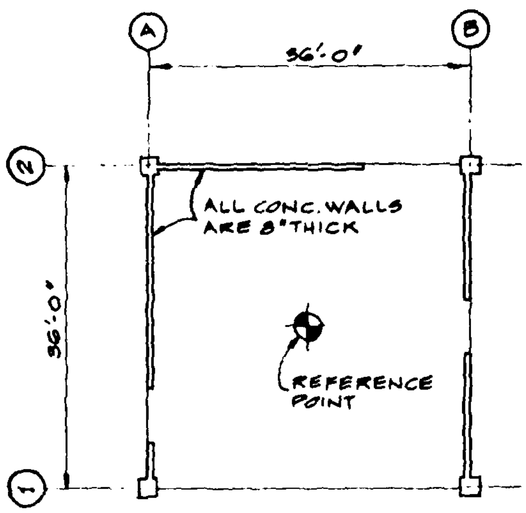
This three story building has complex shear wall framing on three of the four sides of the structure. The fourth side is open. The structure is analyzed for lateral seismic loads in two directions. Time periods and mode shapes are evaluated.

(ii) Significant options of CTABS80 activated

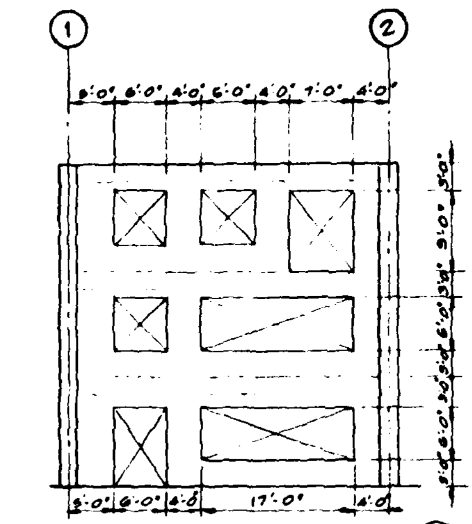
1. Mass properties calculated automatically
2. Section properties calculated automatically
3. Shear panel usage
4. UBC loads calculated automatically
5. Plotting
6. Static lateral load analysis

(iii) Comments

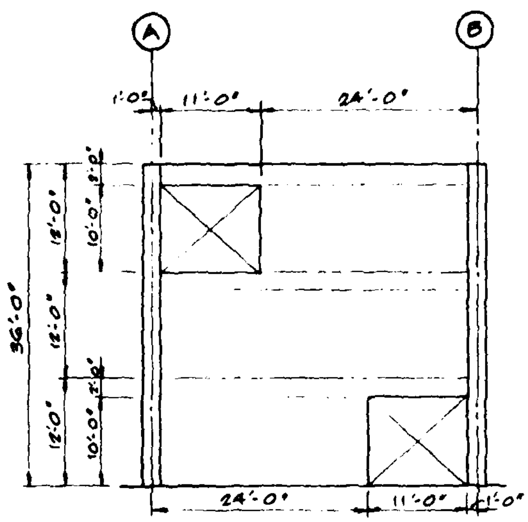
This example demonstrates modeling of complex shear wall systems. Discontinuous shear walls and shear walls with arbitrarily located openings can very effectively be modeled as shown in this example.



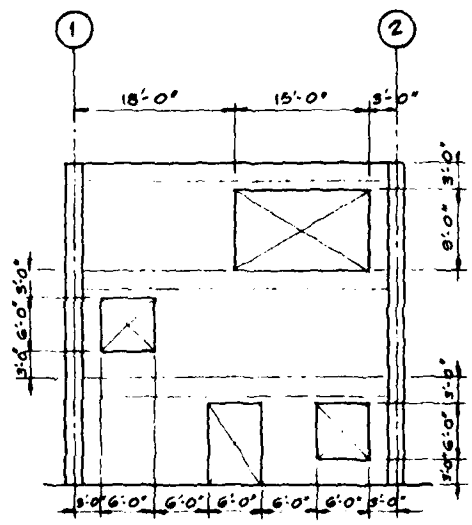
PLAN



ELEVATION - LINE A

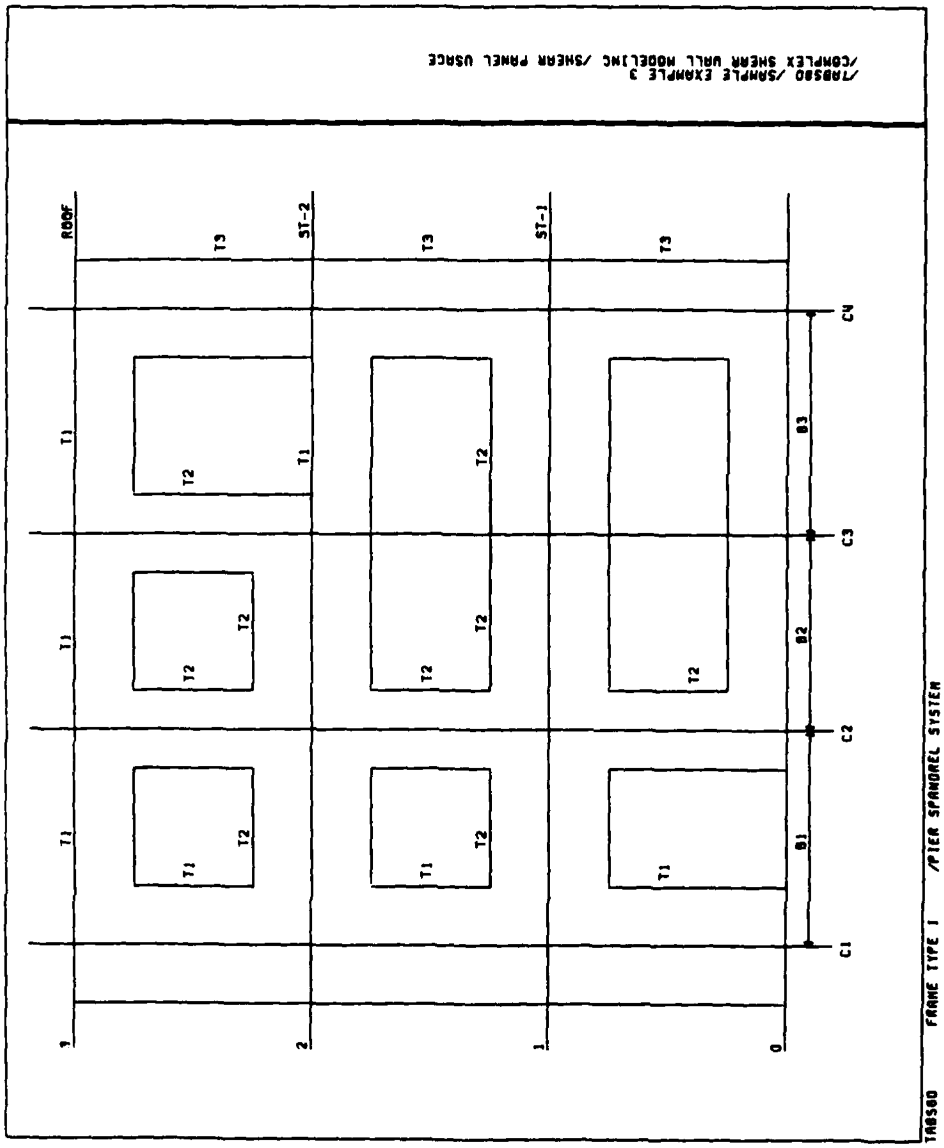


ELEVATION - LINE 2

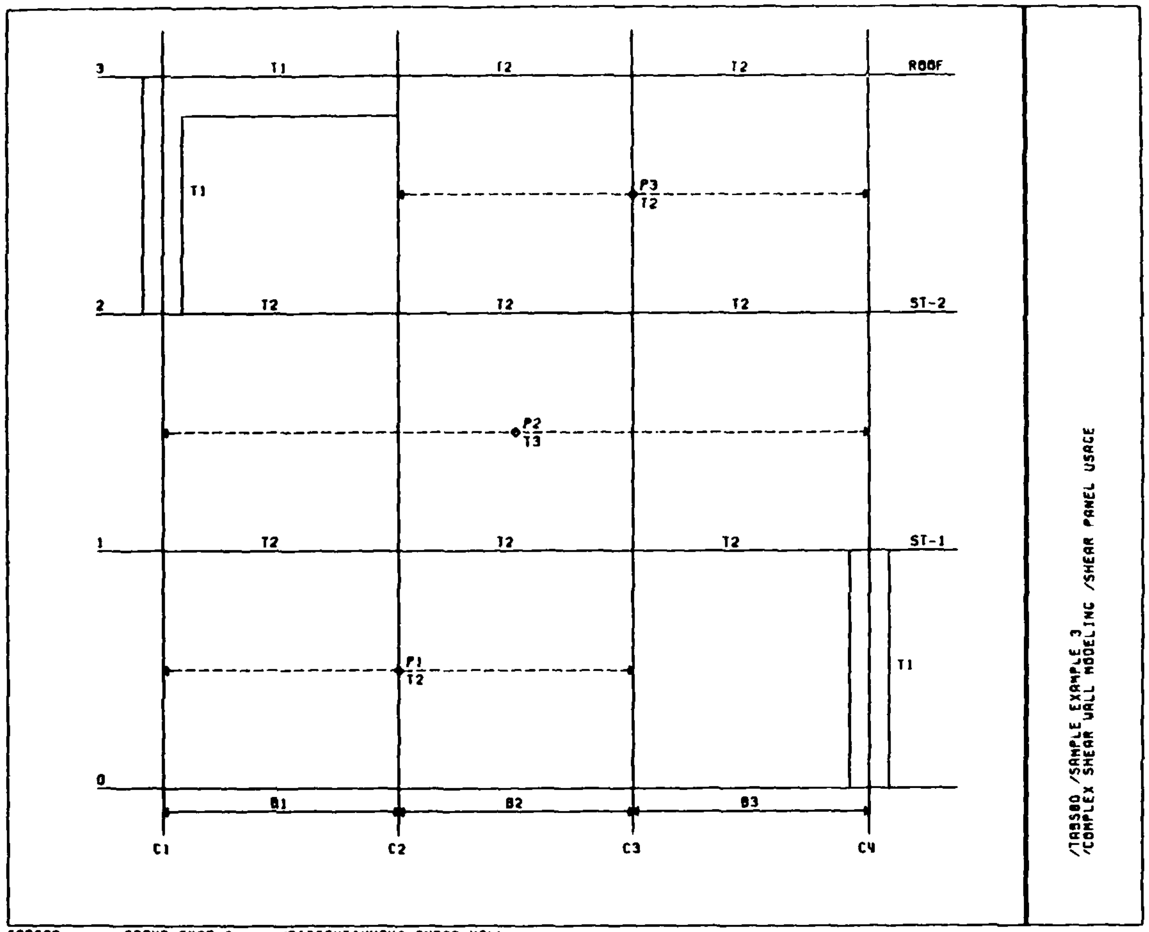


ELEVATION - LINE B

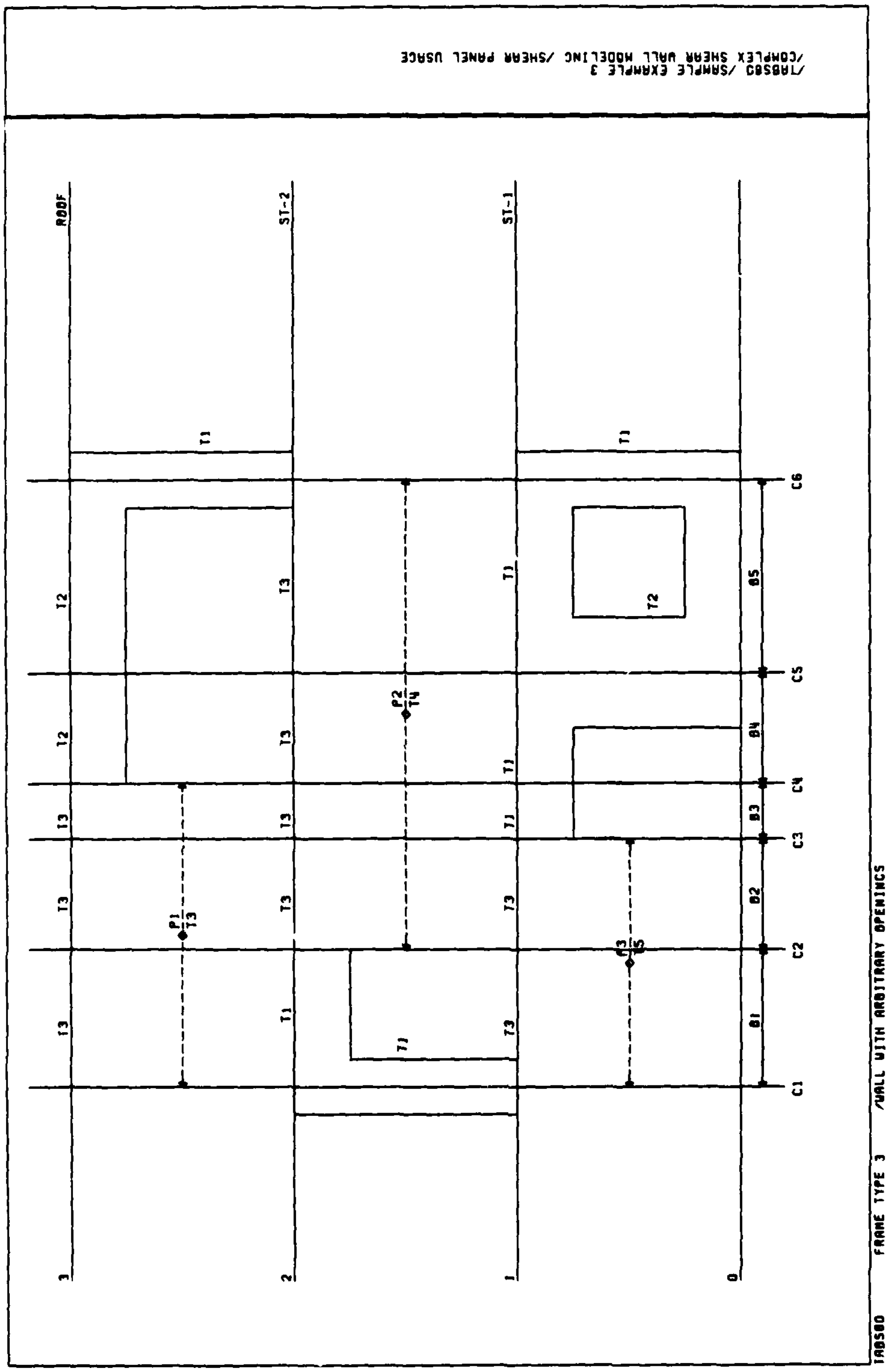
EXAMPLE 3



/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE
TABS80
FRAME TYPE 1
/PIER SPANDREL SYSTEM
ROOF
ST-2
ST-1
C1
C2
C3
C4
B1
B2
B3
T1
T2
T3



TABS80 FRAME TYPE 2 /DISCONTINUOUS SHEAR WALL


/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE
ROOF
ST-2
ST-1
3
2
1
0
C1
C2
C3
C4
C5
C6
B1
B2
B3
B4
B5
T1
T2
T3
P1 T3
P2 T4
P3 T5
TABS80
FRAME TYPE 3
/WALL WITH ARBITRARY OPENINGS

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

PAGE 1
06/09/80

TOTAL NUMBER OF STORIES IN STRUCTURE--------	3
NUMBER OF DIFFERENT FRAMES IN STRUCTURE-----	3
TOTAL NUMBER OF FRAMES IN STRUCTURE---------	3
TOTAL NUMBER OF STRUCTURAL LOAD CASES-------	2
TYPE OF ANALYSIS----------------------------	2
NUMBER OF MODES CONSIDERED------------------	9
LATERAL STORY TRANSLATION CODE--------------	0
EXECUTION MODE------------------------------	0
FRAME JOINT RIGID ZONE MODIFICATION CODE----	0
FRAME JOINT DISPLACEMENT PRINT FLAG---------	0
UBC LATERAL SEISMIC FORCE CODE--------------	1
NUMBER OF STORY MASS PATTERNS---------------	1
MASTER PEN PLOT FLAG------------------------	2

CONVERSION DATA FOR STRESSES

LENGTH CONVERSION FACTOR-------------------	12.000
FORCE CONVERSION FACTOR--------------------	1000.000

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

PAGE 2
06/09/80

STORY MASS TYPE NUMBER----------------------	1
NUMBER OF MASS SEGMENTS---------------------	1
MASS SCALE FACTOR---------------------------	.311E-01

SEGMENT NUMBER	SEGMENT MASS	COORDINATES OF CENTER X	Y	DIMENSIONS OF SEGMENT X	Y
1	260.00	0.00	0.00	36.00	36.00

CALCULATED STORY MASS PROPERTIES

STORY MASS----------------------------------	8.07
MASS MOMENT OF INERTIA----------------------	1744.1
X-ORDINATE OF CENTER OF MASS----------------	0.00
Y-ORDINATE OF CENTER OF MASS----------------	0.00

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

PAGE 3
06/09/80

STRUCTURAL STORY DATA . . .

LEVEL	MASS TYPE	HEIGHT	K-X	K-Y	K-ROTN
ROOF	1	12.00	0.	0.	0.
ST-2	1	12.00	0.	0.	0.
ST-1	1	12.00	0.	0.	0.

STRUCTURAL MASS DATA . . .

LEVEL	MASS	MMI	XM	YM
ROOF	8.075	1744.1	0.00	0.00
ST-2	8.075	1744.1	0.00	0.00
ST-1	8.075	1744.1	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION A . . .

LEVEL	FX	FY	X	Y
ROOF	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION B . . .

LEVEL	FX	FY	X	Y
ROOF	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

/PIER SPANDREL SYSTEM

FRAME IDENTIFICATION NUMBER------------------	1
NUMBER OF COLUMN LINES IN FRAME--------------	4
NUMBER OF STORY LEVELS IN FRAME--------------	3
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	3
NUMBER OF BEAM PROPERTIES--------------------	2
NUMBER OF BEAM SPAN LOADING PATTERNS---------	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING------	0
NUMBER OF PANEL ELEMENTS IN FRAME------------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME---------	0
FRAME PEN PLOT FLAG--------------------------	0
STORY CONNECTIVITY CODE----------------------	0

BAY WIDTHS
11.00 10.00 11.50

SILL DEPTHS
0.00 3.00 3.00

COLUMN SECTION PROPERTY DATA

	ID	U	E	A	I	AV	W	T
-	1	0.000	432000.0	.402E+01	.121E+02	3.35	6.00	.67
-	2	0.000	432000.0	.268E+01	.357E+01	2.23	4.00	.67
-	3	0.000	432000.0	.335E+01	.698E+01	2.79	5.00	.67

BEAM SECTION PROPERTY DATA

	ID	U	E	I	K	C	DB	DA	AV	T
-	1	0.000	432000.0	.151E+01	4.00	.50	3.00	0.00	1.68	.67
-	2	0.000	432000.0	0.	4.00	.50	3.00	3.00	0.00	0.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3	4
ROOF	1	2	2	3
ST-2	1	2	0	3
ST-1	1	2	0	3

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2	3
ROOF	1	1	1

LEVEL	1	2	3
ST-2	2	2	1
ST-1	2	2	2

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	---------VERTICAL LOAD COND---------/ I	II	III	IV
ROOF	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

FRAME NO.= 1
TIME = .06

/DISCONTINUOUS SHEAR WALL

FRAME IDENTIFICATION NUMBER------------------	2
NUMBER OF COLUMN LINES IN FRAME--------------	4
NUMBER OF STORY LEVELS IN FRAME--------------	3
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	3
NUMBER OF BEAM PROPERTIES--------------------	2
NUMBER OF BEAM SPAN LOADING PATTERNS---------	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING------	0
NUMBER OF PANEL ELEMENTS IN FRAME------------	3
NUMBER OF DIAGONAL ELEMENTS IN FRAME---------	0
FRAME PEN PLOT FLAG--------------------------	0
STORY CONNECTIVITY CODE----------------------	0

BAY WIDTHS
12.00 12.00 12.00

SILL DEPTHS
0.00 0.00 0.00

COLUMN SECTION PROPERTY DATA

	ID	U	E	A	I	AV	W	T
-	1	0.000	432000.0	.400E+01	.133E+01	3.33	2.00	2.00
-	2	0.000	432000.0	.161E+02	.772E+03	13.40	24.00	.67
-	3	0.000	432000.0	.241E+02	.260E+04	20.10	36.00	.67

BEAM SECTION PROPERTY DATA

	ID	U	E	I	K	C	DB	DA	AV	T
-	1	0.000	432000.0	.667E+00	4.00	.50	2.00	0.00	1.67	1.00
	2	0.000	432000.0	.100E+07	4.00	.50	0.00	0.00	0.00	0.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3	4
ROOF	1	0	0	0
ST-2	0	0	0	0
ST-1	0	0	0	1

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2	3
ROOF	1	2	2

LEVEL	1	2	3
ST-2	2	2	2
ST-1	2	2	2

INPUT AND/OR GENERATED SHEAR PANEL DATA

PANEL ID	LEVEL AT TOP	FIRST BAY	LAST BAY	COLUMN PROP ID
1	1	1	2	2
2	2	1	3	3
3	3	2	3	2

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	--------VERTICAL LOAD COND--------/ I	II	III	IV
ROOF	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

FRAME NO.= 2
TIME = .06

/TABS80 /SAMPLE EXAMPLE 3 PAGE 106
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

/WALL WITH ARBITRARY OPENINGS

FRAME IDENTIFICATION NUMBER------------------	3
NUMBER OF COLUMN LINES IN FRAME--------------	6
NUMBER OF STORY LEVELS IN FRAME--------------	3
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	5
NUMBER OF BEAM PROPERTIES--------------------	3
NUMBER OF BEAM SPAN LOADING PATTERNS---------	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING------	0
NUMBER OF PANEL ELEMENTS IN FRAME------------	3
NUMBER OF DIAGONAL ELEMENTS IN FRAME---------	0
FRAME PEN PLOT FLAG--------------------------	0
STORY CONNECTIVITY CODE----------------------	0

BAY WIDTHS

7.50	6.00	3.00	6.00	10.50

SILL DEPTHS

0.00	0.00	0.00	0.00	3.00

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	W	T
1	0.000	432000.0	.200E+01	.150E+01	1.67	3.00	0.00
2	0.000	432000.0	.400E+01	.120E+02	3.33	6.00	0.00
3	0.000	432000.0	.120E+02	.326E+03	10.00	0.00	0.00
4	0.000	432000.0	.180E+02	.110E+04	15.00	0.00	0.00
5	0.000	432000.0	.100E+02	.180E+03	8.33	0.00	0.00

BEAM SECTION PROPERTY DATA

ID	U	E	I	K	C	DB	DA	AV	T
1	0.000	432000.0	.100E+07	4.00	.50	3.00	0.00	0.00	0.00
2	0.000	432000.0	.150E+01	4.00	.50	3.00	0.00	1.67	0.00
3	0.000	432000.0	.100E+07	4.00	.50	0.00	0.00	0.00	0.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3	4	5	6
ROOF	0	0	0	0	0	1
ST-2	1	0	0	0	0	0
ST-1	0	0	0	0	2	1

/TABS80 /SAMPLE EXAMPLE 3 PAGE 107
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2	3	4	5
ROOF	3	3	3	2	2
ST-2	1	3	3	3	3
ST-1	3	3	1	1	1

INPUT AND/OR GENERATED SHEAR PANEL DATA

PANEL ID	LEVEL AT TOP	FIRST BAY	LAST BAY	COLUMN PROP ID
1	3	1	3	3
2	2	2	5	4
3	1	1	2	5

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	--------VERTICAL LOAD COND--------/ I	II	III	IV
ROOF	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

FRAME NO.= 3
TIME = .09

/TABS80 /SAMPLE EXAMPLE 3 PAGE 108
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

FRAME LOCATION DATA

FRAME NO	FRAME TYPE	PRINT CODE	X1	Y1	X2	Y2	/--FRAME LOCATION--/
1	1	0	-18.00	0.00	-18.00	10.00	/PIER-SPANDREL
2	2	0	0.00	18.00	10.00	18.00	/DISCONTINUOUS WALL
3	3	0	18.00	0.00	18.00	10.00	/ARBITRARY OPENINGS

MODE NUMBER	TIME PERIOD
1	.3419
2	.1192
3	.0733
4	.0598
5	.0393
6	.0361
7	.0208
8	.0201
9	.0108

MODE SHAPES

LEVEL	DIRN	1	2	3	4
ROOF	X	-.186496	.185136	-.146834	-.116754
ROOF	Y	.155014	.220935	.089545	.088724
ROOF	ROTN	.009186	-.001236	.006059	-.016837
ST-2	X	-.133879	.101589	.140234	-.065112
ST-2	Y	.114047	.148436	-.072230	.034155
ST-2	ROTN	.006689	.000041	-.005638	-.011190
ST-1	X	-.053538	.060814	.183793	-.053303
ST-1	Y	.043508	.065791	-.096828	.029162
ST-1	ROTN	.002594	-.000468	-.007276	-.004796

MODE SHAPES

LEVEL	DIRN	5	6	7	8
ROOF	X	.087174	-.061165	.000825	.084754
ROOF	Y	.166215	.028917	.080019	-.010504
ROOF	ROTN	.000731	.004214	-.003434	.010687
ST-2	X	-.068782	.203080	-.065090	-.106293
ST-2	Y	-.167209	-.062517	-.216479	-.040057
ST-2	ROTN	.000249	-.006404	.003999	-.009739
ST-1	X	-.125513	-.191843	.126336	-.053480
ST-1	Y	-.199668	.109515	.194985	.124410
ST-1	ROTN	.000912	.007645	.005427	-.013634

MODE SHAPES

LEVEL	DIRN	9
ROOF	X	.032759
ROOF	Y	-.011693
ROOF	ROTN	.004791
ST-2	X	-.100942
ST-2	Y	.045685
ST-2	ROTN	-.014823
ST-1	X	.096343
ST-1	Y	-.045176
ST-1	ROTN	.014692

MODAL PARTICIPATION FACTORS

MODE NUMBER	P-FACTOR DIRECTION	P-FACTOR VALUE
1	X	-3.01918
	Y	2.52386
	ROTN	32.21217
2	X	2.80623
	Y	3.51375
	ROTN	-2.90106
3	X	1.43075
	Y	-.64203
	ROTN	-11.95605
4	X	-1.89889
	Y	1.22767
	ROTN	-57.24576
5	X	-.86495
	Y	-1.62025
	ROTN	3.29990
6	X	-.40315
	Y	.61298
	ROTN	9.51509
7	X	.50119
	Y	.47256
	ROTN	10.45093
8	X	-.60574
	Y	.59630
	ROTN	-22.12568
9	X	.22738
	Y	-.09031
	ROTN	8.12753

```
UNIFORM BUILDING CODE SEISMIC LOADS FOR DIRECTION  X

V = Z SICK W          SC=0.14 MAX

Z =    1.0000

S =    1.5000
I =    1.0000
C =     .1140
K =    1.3300

W =  780.0025

V =     .1062W
  =  145.2365

FT=    0.0000


UNIFORM BUILDING CODE SEISMIC LOADS FOR DIRECTION  Y

V = Z SICK W          SC=0.14 MAX

Z =    1.0000

S =    1.5000
I =    1.0000
C =     .1931
K =    1.3300

W =  780.0025

V =     .1062W
  =  145.2365

FT=    0.0000
```



```
STATIC SEISMIC LOAD CALCULATION DATA . . .
UBC 1976 (SEAOC CODE)

UBC ZONE FACTOR (Z)-------------------------        1.00
PREDOMINANT SOIL PERIOD (TS)----------------        0.00
UBC IMPORTANCE FACTOR (I)-------------------        1.00
GRAVITATIONAL ACCELERATION------------------       32.20

LOAD CONDITION A (X-DIRECTION) . . .

TOP    LEVEL OF TRIANGULAR DISTRIBUTION-----           3
BOTTOM LEVEL OF TRIANGULAR DISTRIBUTION-----           0
PERIOD OF PREDOMINANT X STRUCTURAL MODE-----        .342
UBC STRUCTURAL SYSTEM FACTOR----------------       1.330

LOAD CONDITION B (Y-DIRECTION) . . .

TOP    LEVEL OF TRIANGULAR DISTRIBUTION-----           3
BOTTOM LEVEL OF TRIANGULAR DISTRIBUTION-----           0
PERIOD OF PREDOMINANT Y STRUCTURAL MODE-----        .119
UBC STRUCTURAL SYSTEM FACTOR----------------       1.330
```

/TABS80 /SAMPLE EXAMPLE 3 PAGE 16
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 06/09/80

STRUCTURAL LATERAL LOAD CONDITIONS
AS ADJUSTED BY UBC SEISMIC REQUIREMENTS

STRUCTURAL LATERAL LOAD CONDITION A (X-DIRECTION). . .

LEVEL	FX	FY	X	Y
ROOF	72.62	0.00	0.00	0.00
ST-2	48.41	0.00	0.00	0.00
ST-1	24.21	0.00	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION B (Y-DIRECTION). . .

LEVEL	FX	FY	X	Y
ROOF	0.00	72.62	0.00	0.00
ST-2	0.00	48.41	0.00	0.00
ST-1	0.00	24.21	0.00	0.00

/TABS80 /SAMPLE EXAMPLE 3 PAGE 18
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 06/09/80

LOAD CASE DEFINITION DATA

NO	IC	I	II	III	IV	A	B	DYN-1	DYN-2	DYN-3	LOAD CASE ID
1	0	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	/SEISMIC-X
2	0	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	/SEISMIC-Y

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS MODAL COMBINATION
DYNAMIC 3 . . . CQC MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

/TABS80 /SAMPLE EXAMPLE 3 PAGE 115
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

STATIC LOAD CONDITION DISPLACEMENTS

DISPLACEMENTS ARE AT THE CENTERS OF MASS OF THE RESPECTIVE LEVELS

LEVEL	DIRN	I	II	III	IV	A	B
ROOF	X	0.00000	0.00000	0.00000	0.00000	.01322	-.00830
ROOF	Y	0.00000	0.00000	0.00000	0.00000	-.00830	.01023
ROOF	ROTN	0.00000	0.00000	0.00000	0.00000	-.00057	.00046
ST-2	X	0.00000	0.00000	0.00000	0.00000	.00927	-.00619
ST-2	Y	0.00000	0.00000	0.00000	0.00000	-.00619	.00737
ST-2	ROTN	0.00000	0.00000	0.00000	0.00000	-.00041	.00034
ST-1	X	0.00000	0.00000	0.00000	0.00000	.00389	-.00232
ST-1	Y	0.00000	0.00000	0.00000	0.00000	-.00232	.00291
ST-1	ROTN	0.00000	0.00000	0.00000	0.00000	-.00016	.00013

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

LATERAL FRAME DISPLACEMENTS IN /ARBITRARY OPENINGS

LEVEL	/SEISMIC-X	/SEISMIC-Y
ROOF	.001929	.001929
ST-2	.001184	.001184
ST-1	.000597	.000597

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

COLUMN FORCES AT LEVEL ST-1 IN /ARBITRARY OPENINGS

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/SEISMIC-X	-65.04	-41.93	-25.75	17.93
5	/SEISMIC-Y	-65.04	-41.93	-25.75	17.93
6	/SEISMIC-X	-19.79	-16.32	-39.72	6.02
6	/SEISMIC-Y	-19.79	-16.32	-39.72	6.02

BEAM FORCES AT LEVEL ST-1 IN /ARBITRARY OPENINGS

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	9.31	16.81	-3.75	3.48	-3.48
1	/SEISMIC-Y	9.31	16.81	-3.75	3.48	-3.48
2	/SEISMIC-X	-16.81	-96.39	39.79	-18.87	18.87
2	/SEISMIC-Y	-16.81	-96.39	39.79	-18.87	18.87
3	/SEISMIC-X	96.39	-19.99	58.19	25.47	-25.47
3	/SEISMIC-Y	96.39	-19.99	58.19	25.47	-25.47
4	/SEISMIC-X	19.99	56.40	-18.20	25.47	-25.47
4	/SEISMIC-Y	19.99	56.40	-18.20	25.47	-25.47
5	/SEISMIC-X	-36.52	34.80	-35.66	-.29	.29
5	/SEISMIC-Y	-36.52	34.80	-35.66	-.29	.29

PANEL FORCES AT LEVEL ST-1 IN /ARBITRARY OPENINGS

PANEL NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
3	/SEISMIC-X	-428.71	-156.55	65.47	48.77
3	/SEISMIC-Y	-428.71	-156.55	65.47	48.77

	LOAD CONDITIONS					
	I	II	III	IV	A	B
STORY SHEAR	0.00	0.00	0.00	0.00	72.62	72.62

/TABS80 /SAMPLE EXAMPLE 3 PAGE 119
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

COLUMN FORCES AT LEVEL ST-2 IN /ARBITRARY OPENINGS

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SEISMIC-X	-9.31	-6.50	17.66	1.76
1	/SEISMIC-Y	-9.31	-6.50	17.66	1.76

BEAM FORCES AT LEVEL ST-2 IN /ARBITRARY OPENINGS

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	22.91	-67.44	45.18	-7.42	7.42
1	/SEISMIC-Y	22.91	-67.44	45.18	-7.42	7.42
2	/SEISMIC-X	67.44	-143.79	105.62	-12.72	12.72
2	/SEISMIC-Y	67.44	-143.79	105.62	-12.72	12.72
3	/SEISMIC-X	143.79	-181.97	162.88	-12.72	12.72
3	/SEISMIC-Y	143.79	-181.97	162.88	-12.72	12.72
4	/SEISMIC-X	181.97	-112.91	147.44	11.51	-11.51
4	/SEISMIC-Y	181.97	-112.91	147.44	11.51	-11.51
5	/SEISMIC-X	112.91	7.93	52.49	11.51	-11.51
5	/SEISMIC-Y	112.91	7.93	52.49	11.51	-11.51

PANEL FORCES AT LEVEL ST-2 IN /ARBITRARY OPENINGS

PANEL NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
2	/SEISMIC-X	-795.03	89.93	-17.66	58.76
2	/SEISMIC-Y	-795.03	89.93	-17.66	58.76

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	60.52	60.52

/TABS80 /SAMPLE EXAMPLE 3 PAGE 120
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

COLUMN FORCES AT LEVEL ROOF IN /ARBITRARY OPENINGS

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
6	/SEISMIC-X	-7.93	-3.72	-.85	1.30
6	/SEISMIC-Y	-7.93	-3.72	-.85	1.30

BEAM FORCES AT LEVEL ROOF IN /ARBITRARY OPENINGS

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	.00	-2.89	1.44	-.38	.38
1	/SEISMIC-Y	.00	-2.89	1.44	-.38	.38
2	/SEISMIC-X	2.89	-5.20	4.04	-.38	.38
2	/SEISMIC-Y	2.89	-5.20	4.04	-.38	.38
3	/SEISMIC-X	5.20	-6.35	5.77	-.38	.38
3	/SEISMIC-Y	5.20	-6.35	5.77	-.38	.38
4	/SEISMIC-X	6.35	-1.27	3.81	.85	-.85
4	/SEISMIC-Y	6.35	-1.27	3.81	.85	-.85
5	/SEISMIC-X	1.27	6.34	-2.53	.85	-.85
5	/SEISMIC-Y	1.27	6.34	-2.53	.85	-.85

PANEL FORCES AT LEVEL ROOF IN /ARBITRARY OPENINGS

PANEL NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SEISMIC-X	-406.84	-13.33	.85	35.01
1	/SEISMIC-Y	-406.84	-13.33	.85	35.01

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	36.31	36.31

FRAME NO. = 1
STRESS TIME= .19

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

LATERAL FRAME DISPLACEMENTS IN /DISCONTINUOUS WALL

LEVEL	/SEISMIC-X	/SEISMIC-Y
ROOF	.002985	.000000
ST-2	.001899	.000000
ST-1	.000973	.000000

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

COLUMN FORCES AT LEVEL ST-1 IN /DISCONTINUOUS WALL

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
4	/SEISMIC-X	-18.74	-15.48	-93.81	2.85
4	/SEISMIC-Y	-.00	.00	-.00	.00

BEAM FORCES AT LEVEL ST-1 IN /DISCONTINUOUS WALL

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	.00	-167.85	83.92	-13.99	13.99
1	/SEISMIC-Y	.00	-.00	.00	-.00	.00
2	/SEISMIC-X	167.85	-335.70	251.77	-13.99	13.99
2	/SEISMIC-Y	.00	-.00	.00	-.00	.00
3	/SEISMIC-X	335.70	-13.78	174.74	29.26	-29.26
3	/SEISMIC-Y	.00	-.00	.00	.00	-.00

PANEL FORCES AT LEVEL ST-1 IN /DISCONTINUOUS WALL

PANEL NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SEISMIC-X	-1796.34	87.72	93.81	142.38
1	/SEISMIC-Y	-.00	.00	.00	.00

	/--------------------LOAD CONDITIONS--------------------/					
	I	II	III	IV	A	B
STORY SHEAR	0.00	0.00	0.00	0.00	145.24	.00

/TANS80 /SAMPLE EXAMPLE 3 PAGE 123
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

BEAM FORCES AT LEVEL ST-2 IN /DISCONTINUOUS WALL

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	8.66	269.91	-130.63	23.21	-23.21
1	/SEISMIC-Y	.00	.00	-.00	.00	-.00
2	/SEISMIC-X	-269.91	134.95	-202.43	-11.25	11.25
2	/SEISMIC-Y	-.00	.00	-.00	-.00	.00
3	/SEISMIC-X	-134.95	-.00	-67.48	-11.25	11.25
3	/SEISMIC-Y	-.00	-.00	-.00	-.00	.00

PANEL FORCES AT LEVEL ST-2 IN /DISCONTINUOUS WALL

PANEL NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
2	/SEISMIC-X	-2323.78	871.42	-.00	121.03
2	/SEISMIC-Y	-.00	.00	-.00	.00

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	121.03	.00

/TANS80 /SAMPLE EXAMPLE 3 PAGE 124
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE 04/09/81

COLUMN FORCES AT LEVEL ROOF IN /DISCONTINUOUS WALL

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SEISMIC-X	-8.66	-4.15	.99	1.28
1	/SEISMIC-Y	-.00	-.00	.00	.00

BEAM FORCES AT LEVEL ROOF IN /DISCONTINUOUS WALL

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	5.72	5.20	.26	.99	-.99
1	/SEISMIC-Y	.00	.00	.00	.00	-.00
2	/SEISMIC-X	-5.20	2.60	-3.90	-.22	.22
2	/SEISMIC-Y	-.00	.00	-.00	-.00	.00
3	/SEISMIC-X	-2.60	0.00	-1.30	-.22	.22
3	/SEISMIC-Y	-.00	0.00	-.00	-.00	.00

PANEL FORCES AT LEVEL ROOF IN /DISCONTINUOUS WALL

PANEL NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
3	/SEISMIC-X	-838.94	-17.11	-.99	71.34
3	/SEISMIC-Y	-.00	-.00	-.00	.00

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	72.62	.00

FRAME NO. = 2
STRESS TYPE= .12

LATERAL FRAME DISPLACEMENTS IN /PIER-SPANDREL

LEVEL	/SEISMIC-X	/SEISMIC-Y
ROOF	-.018536	.018536
ST-2	-.013557	.013557
ST-1	-.005229	.005229

COLUMN FORCES AT LEVEL ST-1 IN /PIER-SPANDREL

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SEISMIC-X	445.59	-234.41	-20.70	-23.46
1	/SEISMIC-Y	-445.59	234.41	20.70	23.46
2	/SEISMIC-X	199.59	-71.40	-10.75	-21.37
2	/SEISMIC-Y	-199.59	71.40	10.75	21.37
4	/SEISMIC-X	336.82	-170.08	31.45	-27.79
4	/SEISMIC-Y	-336.82	170.08	-31.45	27.79

BEAM FORCES AT LEVEL ST-1 IN /PIER-SPANDREL

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	0.00	0.00	0.00	0.00	0.00
1	/SEISMIC-Y	0.00	0.00	0.00	0.00	0.00
2	/SEISMIC-X	0.00	0.00	0.00	0.00	0.00
2	/SEISMIC-Y	0.00	0.00	0.00	0.00	0.00
3	/SEISMIC-X	0.00	0.00	0.00	0.00	0.00
3	/SEISMIC-Y	0.00	0.00	0.00	0.00	0.00

STORY SHEAR /------------------LOAD CONDITIONS------------------/

	I	II	III	IV	A	B
STORY SHEAR	0.00	0.00	0.00	0.00	-72.62	72.62

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

COLUMN FORCES AT LEVEL ST-2 IN /PIER-SPANDREL

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SEISMIC-X	65.52	131.49	-20.70	-32.84
1	/SEISMIC-Y	-65.52	-131.49	20.70	32.84
2	/SEISMIC-X	.28	13.76	-10.75	-2.34
2	/SEISMIC-Y	-.28	-13.76	10.75	2.34
4	/SEISMIC-X	10.70	141.34	31.45	-25.34
4	/SEISMIC-Y	-10.70	-141.34	-31.45	25.34

BEAM FORCES AT LEVEL ST-2 IN /PIER-SPANDREL

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	0.00	0.00	0.00	0.00	0.00
1	/SEISMIC-Y	0.00	0.00	0.00	0.00	0.00
2	/SEISMIC-X	0.00	0.00	0.00	0.00	0.00
2	/SEISMIC-Y	0.00	0.00	0.00	0.00	0.00
3	/SEISMIC-X	-106.50	-101.18	-2.66	-23.08	23.08
3	/SEISMIC-Y	106.50	101.18	2.66	23.08	-23.08

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	-60.52	60.52

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

COLUMN FORCES AT LEVEL ROOF IN /PIER-SPANDREL

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SEISMIC-X	-208.79	166.36	-20.70	7.07
1	/SEISMIC-Y	208.79	-166.36	20.70	-7.07
2	/SEISMIC-X	-72.14	174.86	-10.75	-17.12
2	/SEISMIC-Y	72.14	-174.86	10.75	17.12
3	/SEISMIC-X	29.42	127.74	23.08	-26.03
3	/SEISMIC-Y	-29.42	-127.74	-23.08	26.03
4	/SEISMIC-X	-58.49	60.59	8.37	-.73
4	/SEISMIC-Y	58.49	-60.59	-8.37	[illegible]

BEAM FORCES AT LEVEL ROOF IN /PIER-SPANDREL

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SEISMIC-X	-83.06	-41.12	-20.97	-20.70	20.70
1	/SEISMIC-Y	83.06	41.12	20.97	20.70	-20.70
2	/SEISMIC-X	-80.80	-107.90	13.55	-31.45	31.45
2	/SEISMIC-Y	80.80	107.90	-13.55	31.45	-31.45
3	/SEISMIC-X	-18.27	-40.35	11.04	-8.37	8.37
3	/SEISMIC-Y	18.27	40.35	-11.04	8.37	-8.37

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	-36.31	36.31

FRAME NO. = 3
STRESS TYPE= .13

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

PAGE 129
04/09/81

SUMMARY OF STORY SHEAR DISTRIBUTION
STORY-BY-STORY / FRAME-BY-FRAME

LEVEL ID	/--FRAME LOCATION--/	I	II	III	IV	A	B
		/-------------------LOAD	CONDITIONS	-------------------/			
ST-1	/PIER-SPANDREL	0.00	0.00	0.00	0.00	-72.62	72.62
	/DISCONTINUOUS WALL	0.00	0.00	0.00	0.00	145.24	.00
	/ARBITRARY OPENINGS	0.00	0.00	0.00	0.00	72.62	72.62
ST-2	/PIER-SPANDREL	0.00	0.00	0.00	0.00	-60.52	60.52
	/DISCONTINUOUS WALL	0.00	0.00	0.00	0.00	121.03	.00
	/ARBITRARY OPENINGS	0.00	0.00	0.00	0.00	60.52	60.52
ROOF	/PIER-SPANDREL	0.00	0.00	0.00	0.00	-36.31	36.31
	/DISCONTINUOUS WALL	0.00	0.00	0.00	0.00	72.62	.00
	/ARBITRARY OPENINGS	0.00	0.00	0.00	0.00	36.31	36.31

/TABS80 /SAMPLE EXAMPLE 3
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE

PAGE 130
04/09/81

TIME LOG (SECONDS)

FORM FRAME STIFFNESSES................	=	.24
SOLVE STATIC LOAD CASES...............	=	.02
MODE SHAPES AND FREQUENCIES...........	=	.09
COMPUTE FRAME DISPLACEMENTS...........	=	.01
MEMBER FORCES AND STRESSES............	=	.47
TOTAL TIME...........................	=	.83

D. Example 4 (a and b)

(i) Description

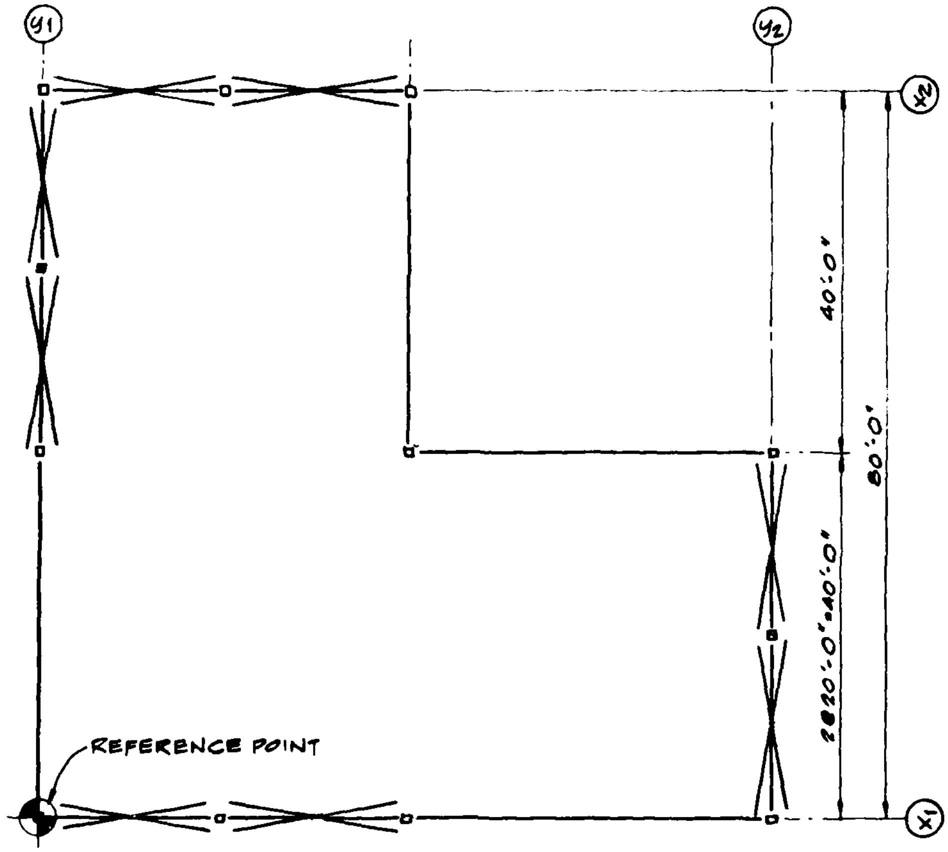
This three story L-shaped braced frame structure is subjected to dynamic loads. Example 4a is response spectrum dynamics and Example 4b is time history dynamics. In both examples the dynamic ground exitation is in the X direction.

(ii) Significant options of CTABS80 activated

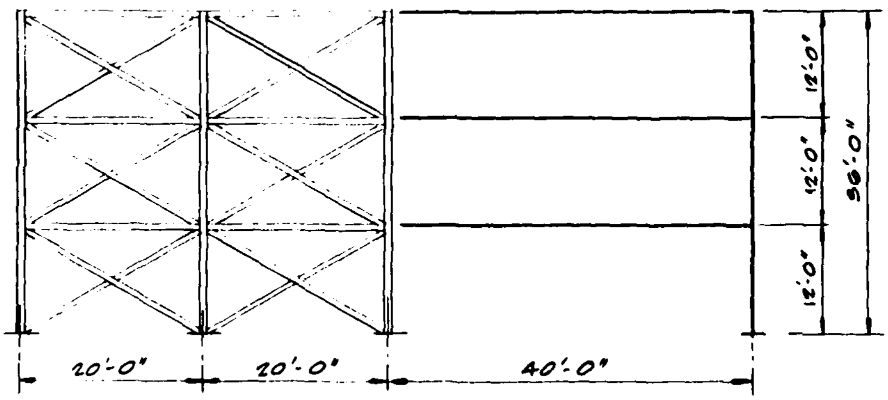
1. Mass properties calculated by program
2. Non-bending (axial only) diagonal element usage
3. Dynamic analysis, response spectrum, and time history
4. SRSS, ABS, and CQC modal combination techniques
5. Uncombined modal output

(iii) Comments

Only two modes of the structure were included in the analysis. Comparison of the response spectrum and the time history results indicate that the SRSS and the ABS combinations highly overestimate the time history results in the frames normal to the direction of excitation. Where as the SRSS combination underestimates the time history results in the frames parallel to the direction of the excitation, the ABS combination comes very close. However, the CQC combination estimates the time history results accurately for all frames, due to the fact that this method performs an algebraic modal summation on closely spaced modes and the effects are dramatic in situations like these where high modal cross coupling exists.



PLAN



ELEVATION

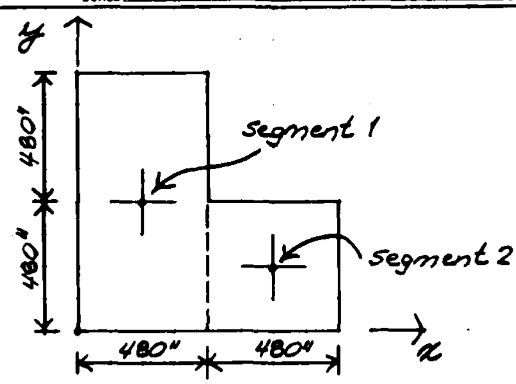
EXAMPLE 4

Computers/Structures International
4009 Webster Street
OAKLAND, CALIFORNIA 94609
(415) 655-9151

JOB CTABS80/Example 4
SHEET NO ______ OF ______
CALCULATED BY AH DATE 5/20/80
CHECKED BY ______ DATE ______
SCALE ______

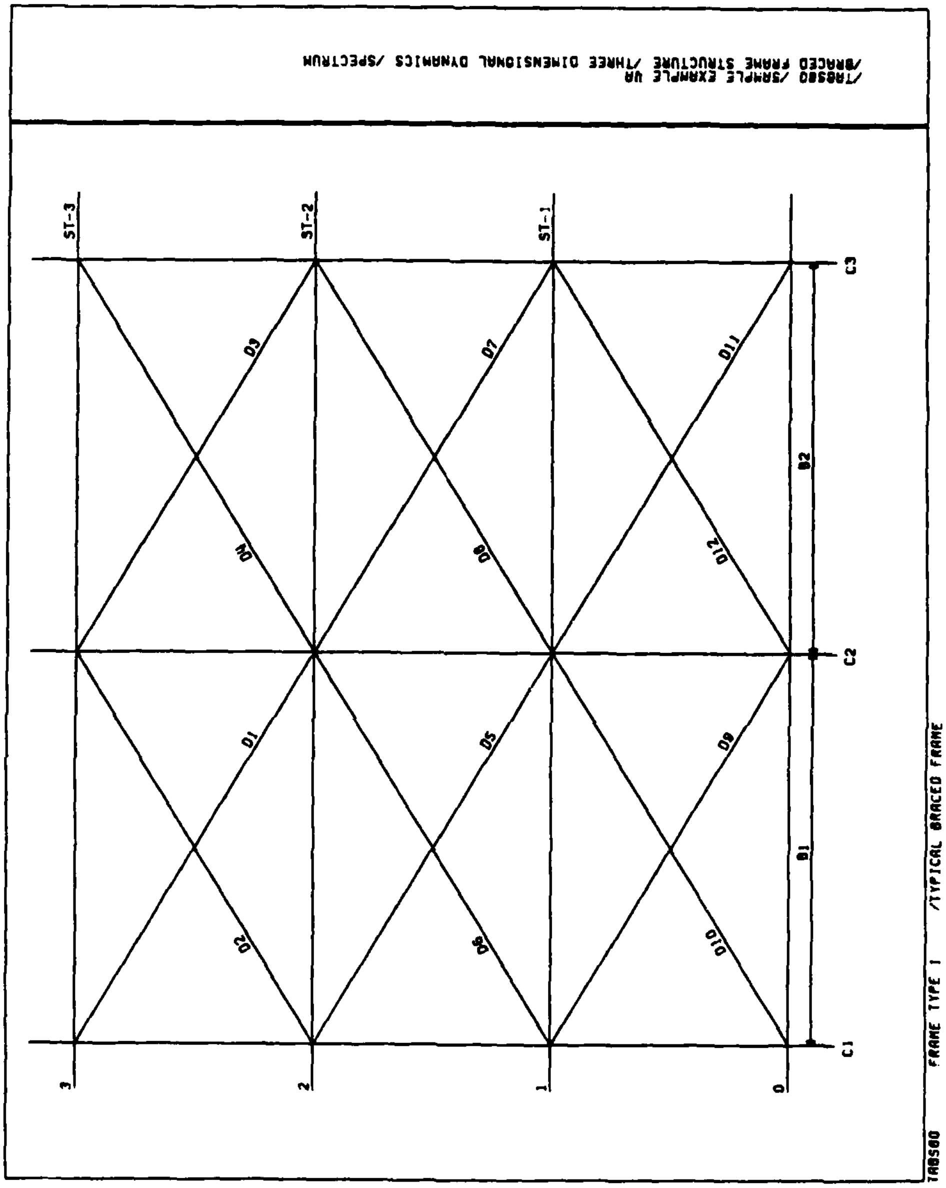
Average Diaphragm weight assumed 100 psf

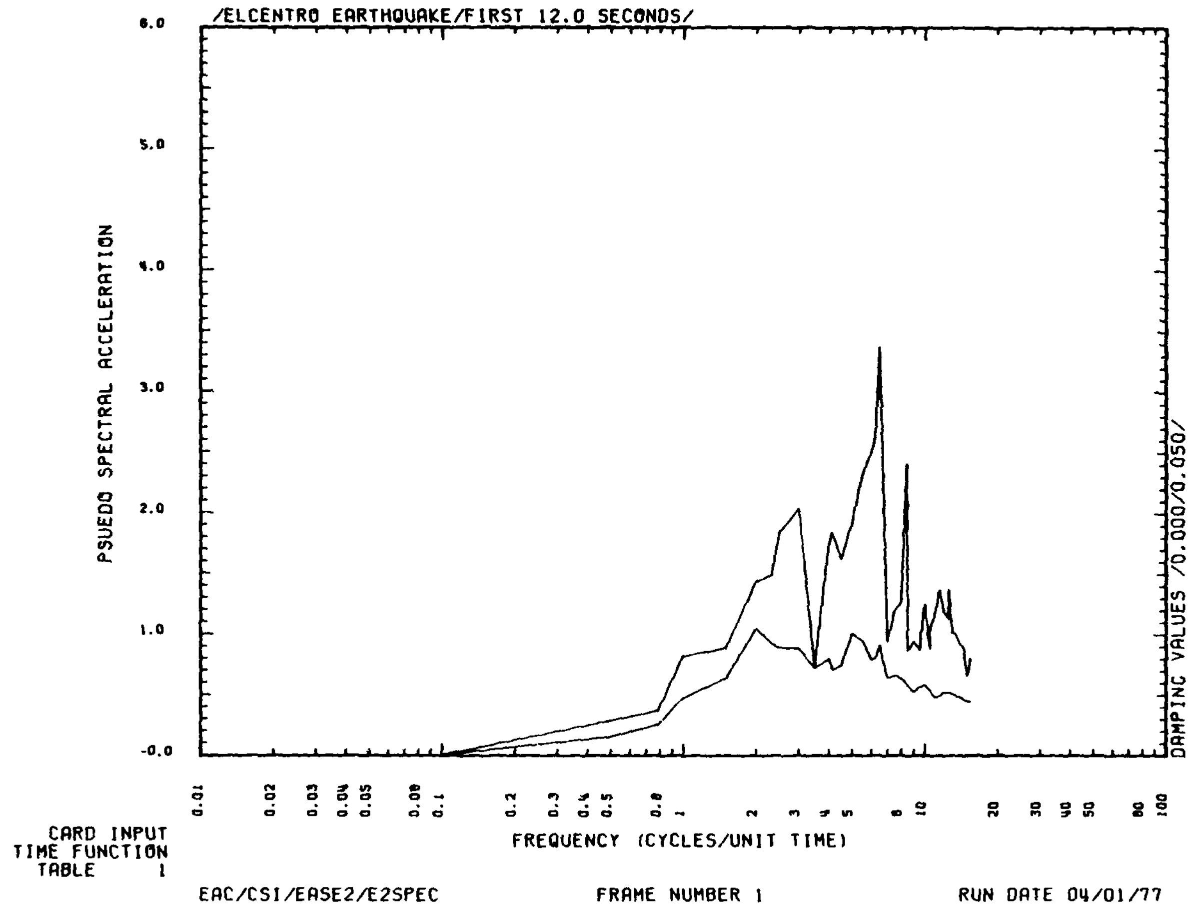
Each level is discretized into two rectangular segments, for program input purposes to use the program dynamic property calculation option



Seg #	Weight^k	XM	YM	B	D
1	320.	240.	480.	480.	960.
2	160.	720.	240.	480.	480

Using a scale factor of $1/386.4 = .00259$ to convert weight to mass


/TABS80 /SAMPLE EXAMPLE VA
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM
ST-3
ST-2
ST-1
C3
C2
C1
B2
B1
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
3
2
1
0
TABS80
FRAME TYPE 1 /TYPICAL BRACED FRAME



/ELCENTRO EARTHQUAKE/FIRST 12.0 SECONDS/
PSUEDO SPECTRAL ACCELERATION
6.0
5.0
4.0
3.0
2.0
1.0
-0.0
DAMPING VALUES /0.000/0.050/
0.01
0.02
0.03
0.04
0.05
0.08
0.1
0.2
0.3
0.4
0.5
0.8
1
2
3
4
5
8
10
20
30
40
50
80
100
FREQUENCY (CYCLES/UNIT TIME)
CARD INPUT
TIME FUNCTION
TABLE 1
EAC/CSI/EASE2/E2SPEC
FRAME NUMBER 1
RUN DATE 04/01/77

/TABS80 /SAMPLE EXAMPLE 4A PAGE 1
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM 06/06/80

TOTAL NUMBER OF STORIES IN STRUCTURE--------	3
NUMBER OF DIFFERENT FRAMES IN STRUCTURE-----	1
TOTAL NUMBER OF FRAMES IN STRUCTURE---------	4
TOTAL NUMBER OF STRUCTURAL LOAD CASES-------	3
TYPE OF ANALYSIS----------------------------	3
NUMBER OF MODES CONSIDERED------------------	2
LATERAL STORY TRANSLATION CODE--------------	0
EXECUTION MODE------------------------------	0
FRAME JOINT RIGID ZONE MODIFICATION CODE----	0
FRAME JOINT DISPLACEMENT PRINT FLAG---------	0
UBC LATERAL SEISMIC FORCE CODE--------------	0
NUMBER OF STORY MASS PATTERNS---------------	1
MASTER PEN PLOT FLAG------------------------	2

CONVERSION DATA FOR STRESSES

LENGTH CONVERSION FACTOR--------------------	1.000
FORCE CONVERSION FACTOR---------------------	1.000

/TABS80 /SAMPLE EXAMPLE 4A PAGE 2
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM 06/06/80

STORY MASS TYPE NUMBER----------------------	1
NUMBER OF MASS SEGMENTS---------------------	2
MASS SCALE FACTOR---------------------------	.259E-02

SEGMENT NUMBER	SEGMENT MASS	COORDINATES OF CENTER X	Y	DIMENSIONS OF SEGMENT X	Y
1	320.00	240.00	480.00	480.00	560.00
2	160.00	720.00	240.00	480.00	480.00

CALCULATED STORY MASS PROPERTIES

STORY MASS----------------------------------	1.24
MASS MOMENT OF INERTIA----------------------	174907.4
X-ORDINATE OF CENTER OF MASS----------------	400.00
Y-ORDINATE OF CENTER OF MASS----------------	400.00

/TABS80 /SAMPLE EXAMPLE 4A PAGE 3
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM 06/06/80

STRUCTURAL STORY DATA . . .

LEVEL	MASS TYPE	HEIGHT	K-X	K-Y	K-ROTN
ST-3	1	144.00	0.	0.	0.
ST-2	1	144.00	0.	0.	0.
ST-1	1	144.00	0.	0.	0.

STRUCTURAL MASS DATA . . .

LEVEL	MASS	MMI	XM	YM
ST-3	1.242	174907.4	400.00	400.00
ST-2	1.242	174907.4	400.00	400.00
ST-1	1.242	174907.4	400.00	400.00

STRUCTURAL LATERAL LOAD CONDITION A . . .

LEVEL	FX	FY	X	Y
ST-3	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION B . . .

LEVEL	FX	FY	X	Y
ST-3	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

/TYPICAL BRACED FRAME

FRAME IDENTIFICATION NUMBER-----------------	1
NUMBER OF COLUMN LINES IN FRAME-------------	3
NUMBER OF STORY LEVELS IN FRAME-------------	3
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	1
NUMBER OF BEAM PROPERTIES-------------------	1
NUMBER OF BEAM SPAN LOADING PATTERNS--------	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----	0
NUMBER OF PANEL ELEMENTS IN FRAME-----------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------	12
FRAME PEN PLOT FLAG-------------------------	0
STORY CONNECTIVITY CODE---------------------	0

BAY WIDTHS
240.00 240.00

SILL DEPTHS
0.00 0.00

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	W	T
1	0.000	29500.0	.600E+01	0.	0.00	0.00	0.00

BEAM SECTION PROPERTY DATA

ID	U	E	I	K	C	DB	DA	AV	T
1	0.000	0.0	0.	4.00	.50	0.00	0.00	0.00	0.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1	2	3
ST-3	1	1	1
ST-2	1	1	1
ST-1	1	1	1

INPUT/GENERATED BEAM LOCATIONS

LEVEL	1	2
ST-3	0	0
ST-2	0	0
ST-1	0	0

INPUT AND/OR GENERATED DIAGONAL DATA

DIAGONAL ID	LEVEL AT TOP	LOWER COLUMN	UPPER COLUMN	COLUMN PROP ID
1	3	2	1	1
2	3	1	2	1
3	3	3	2	1
4	3	2	3	1
5	2	2	1	1
6	2	1	2	1
7	2	3	2	1
8	2	2	3	1
9	1	2	1	1
10	1	1	2	1
11	1	3	2	1
12	1	2	3	1

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	---------VERTICAL LOAD COND--------/ I	II	III	IV
ST-3	0.00	0.00	0.00	0.00
ST-2	0.00	0.00	0.00	0.00
ST-1	0.00	0.00	0.00	0.00

FRAME NO.= 1
TIME = .05

FRAME LOCATION DATA

FRAME NO	FRAME TYPE	PRINT CODE	X1	Y1	X2	Y2	/--FRAME LOCATION--/
1	1	0	0.00	0.00	10.00	0.00	FRAME X1
2	1	1	0.00	960.00	10.00	960.00	FRAME X2
3	1	0	0.00	0.00	0.00	10.00	FRAME Y1
4	1	1	960.00	0.00	960.00	10.00	FRAME Y2

MODE NUMBER	TIME PERIOD
1	.3269
2	.3206

MODE SHAPES

LEVEL	DIRN	1	2
ST-3	X	-.502918	.506866
ST-3	Y	.502918	.506866
ST-3	ROTN	.000238	-.000000
ST-2	X	-.343469	.346166
ST-2	Y	.343469	.346166
ST-2	ROTN	.000163	-.000000
ST-1	X	-.159232	.160482
ST-1	Y	.159232	.160482
ST-1	ROTN	.000075	.000000

MODAL PARTICIPATION FACTORS

MODE NUMBER	P-FACTOR DIRECTION	P-FACTOR VALUE
1	X	-1.24922
	Y	1.24922
	ROTN	83.22562
2	X	1.25903
	Y	1.25903
	ROTN	-.00000

ACCELERATION SPECTRUM EL CENTRO EARTHQUAKE

NO OF PERIOD CARDS = 51
NO OF SEPARATE MODES = 2
SCALE FACTOR = 386.400
ANGLE OF EQ INCIDENCE = 90.000
STRUCTURAL DAMPING = .050

PERIOD	ACCELERATION
0.000	.328
.026	.330
.027	.330
.028	.343
.029	.354
.029	.363
.030	.368
.031	.368
.032	.363
.033	.360
.035	.364
.036	.363
.037	.361
.039	.359
.040	.355
.042	.346
.044	.344
.046	.347
.048	.353
.050	.354
.053	.354
.056	.355
.059	.352
.063	.431
.067	.446
.071	.478

/TABS80 /SAMPLE EXAMPLE 9A
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM

PAGE 10
06/06/80

MAXIMUM MODAL INERTIA LOADS/TORSIONS
GENERATED IN EACH LEVEL (AT CENTER OF MASS)

LEVEL	DIRN	1	2
ST-3	X	244.27	243.30
ST-3	Y	-244.27	243.30
ST-3	ROTN	-16274.51	-.00
ST-2	X	166.82	166.16
ST-2	Y	-166.82	166.16
ST-2	ROTN	-11114.73	-.00
ST-1	X	77.34	77.03
ST-1	Y	-77.34	77.03
ST-1	ROTN	-5152.76	.00

/TABS80 /SAMPLE EXAMPLE 9A
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM

PAGE 11
06/06/80

MAXIMUM MODAL STORY SHEARS AT EACH LEVEL

LEVEL	DIRN	1	2
ST-3	X	244.27	243.30
ST-3	Y	-244.27	243.30
ST-2	X	411.09	409.46
ST-2	Y	-411.09	409.46
ST-1	X	488.43	486.49
ST-1	Y	-488.43	486.49

/TABS80 /SAMPLE EXAMPLE 9A
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM

PAGE 13
04/09/81

LOAD CASE DEFINITION DATA

NO	IC	I	II	III	IV	A	B	DYN-1	DYN-2	DYN-3	LOAD CASE ID
1	0	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	/SRSS
2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	/ABS
3	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	/CQC

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS MODAL COMBINATION
DYNAMIC 3 . . . CQC MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

/TABS80 /SAMPLE EXAMPLE 4A PAGE 14
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM 06/06/80

LATERAL FRAME DISPLACEMENTS IN FRAME Y1

LEVEL	/SRSS	/ABS	/CQC	MODE 1
ST-3	.812896	1.143010	.195743	-.632969
ST-2	.599170	.780628	.133683	-.432298
ST-1	.257375	.361897	.061975	-.200408

LATERAL FRAME DISPLACEMENTS IN FRAME Y1

LEVEL	MODE 2
ST-3	.510049
ST-2	.340340
ST-1	.161489

/TABS80 /SAMPLE EXAMPLE 4A PAGE 15
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM 06/06/80

COLUMN FORCES AT LEVEL ST-1 IN FRAME Y1

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	200.55	0.00
1	/ABS	0.00	0.00	281.59	0.00
1	/CQC	0.00	0.00	48.29	0.00
1	MODE 1	0.00	0.00	-156.16	0.00
1	MODE 2	0.00	0.00	125.83	0.00
2	/SRSS	0.00	0.00	.00	0.00
2	/ABS	0.00	0.00	.00	0.00
2	/CQC	0.00	0.00	.00	0.00
2	MODE 1	0.00	0.00	-.00	0.00
2	MODE 2	0.00	0.00	.00	0.00
3	/SRSS	0.00	0.00	200.55	0.00
3	/ABS	0.00	0.00	281.59	0.00
3	/CQC	0.00	0.00	48.29	0.00
3	MODE 1	0.00	0.00	156.16	0.00
3	MODE 2	0.00	0.00	-125.83	0.00

DIAGONAL FORCES AT LEVEL ST-1 IN FRAME Y1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
9	/SRSS	0.00	0.00	86.48	0.00
9	/ABS	0.00	0.00	121.60	0.00
9	/CQC	0.00	0.00	20.82	0.00
9	MODE 1	0.00	0.00	67.34	0.00
9	MODE 2	0.00	0.00	-54.26	0.00
10	/SRSS	0.00	0.00	139.57	0.00
10	/ABS	0.00	0.00	196.25	0.00
10	/CQC	0.00	0.00	33.61	0.00
10	MODE 1	0.00	0.00	-108.68	0.00
10	MODE 2	0.00	0.00	87.57	0.00
11	/SRSS	0.00	0.00	139.57	0.00
11	/ABS	0.00	0.00	196.25	0.00
11	/CQC	0.00	0.00	33.61	0.00
11	MODE 1	0.00	0.00	108.68	0.00
11	MODE 2	0.00	0.00	-87.57	0.00
12	/SRSS	0.00	0.00	86.48	0.00
12	/ABS	0.00	0.00	121.60	0.00
12	/CQC	0.00	0.00	20.82	0.00
12	MODE 1	0.00	0.00	-67.34	0.00
12	MODE 2	0.00	0.00	54.26	0.00

COLUMN FORCES AT LEVEL ST-2 IN FRAME Y1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	100.28	0.00
1	/ABS	0.00	0.00	141.00	0.00
1	/CQC	0.00	0.00	24.15	0.00
1	MODE 1	0.00	0.00	-78.08	0.00
1	MODE 2	0.00	0.00	62.92	0.00
2	/SRSS	0.00	0.00	.00	0.00
2	/ABS	0.00	0.00	.00	0.00
2	/CQC	0.00	0.00	.00	0.00
2	MODE 1	0.00	0.00	-.00	0.00
2	MODE 2	0.00	0.00	.00	0.00
3	/SRSS	0.00	0.00	100.28	0.00
3	/ABS	0.00	0.00	141.00	0.00
3	/CQC	0.00	0.00	24.15	0.00
3	MODE 1	0.00	0.00	78.08	0.00
3	MODE 2	0.00	0.00	-62.92	0.00

DIAGONAL FORCES AT LEVEL ST-2 IN FRAME Y1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/SRSS	0.00	0.00	81.86	0.00
5	/ABS	0.00	0.00	115.10	0.00
5	/CQC	0.00	0.00	19.71	0.00
5	MODE 1	0.00	0.00	63.74	0.00
5	MODE 2	0.00	0.00	-51.36	0.00
6	/SRSS	0.00	0.00	108.40	0.00
6	/ABS	0.00	0.00	152.42	0.00
6	/CQC	0.00	0.00	26.10	0.00
6	MODE 1	0.00	0.00	-84.41	0.00
6	MODE 2	0.00	0.00	68.02	0.00
7	/SRSS	0.00	0.00	108.40	0.00
7	/ABS	0.00	0.00	152.42	0.00
7	/CQC	0.00	0.00	26.10	0.00
7	MODE 1	0.00	0.00	84.41	0.00
7	MODE 2	0.00	0.00	-68.02	0.00
8	/SRSS	0.00	0.00	81.86	0.00
8	/ABS	0.00	0.00	115.10	0.00
8	/CQC	0.00	0.00	19.71	0.00
8	MODE 1	0.00	0.00	-63.74	0.00
8	MODE 2	0.00	0.00	51.36	0.00

COLUMN FORCES AT LEVEL ST-3 IN FRAME Y1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	27.23	0.00
1	/ABS	0.00	0.00	38.29	0.00
1	/CQC	0.00	0.00	6.56	0.00
1	MODE 1	0.00	0.00	-21.20	0.00
1	MODE 2	0.00	0.00	17.08	0.00
2	/SRSS	0.00	0.00	.00	0.00
2	/ABS	0.00	0.00	.00	0.00
2	/CQC	0.00	0.00	.00	0.00
2	MODE 1	0.00	0.00	-.00	0.00
2	MODE 2	0.00	0.00	.00	0.00
3	/SRSS	0.00	0.00	27.23	0.00
3	/ABS	0.00	0.00	38.29	0.00
3	/CQC	0.00	0.00	6.56	0.00
3	MODE 1	0.00	0.00	21.20	0.00
3	MODE 2	0.00	0.00	-17.08	0.00

DIAGONAL FORCES AT LEVEL ST-3 IN FRAME Y1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	52.92	0.00
1	/ABS	0.00	0.00	74.41	0.00
1	/CQC	0.00	0.00	12.74	0.00
1	MODE 1	0.00	0.00	41.21	0.00
1	MODE 2	0.00	0.00	-33.21	0.00
2	/SRSS	0.00	0.00	60.13	0.00
2	/ABS	0.00	0.00	84.55	0.00
2	/CQC	0.00	0.00	14.48	0.00
2	MODE 1	0.00	0.00	-46.82	0.00
2	MODE 2	0.00	0.00	37.73	0.00
3	/SRSS	0.00	0.00	60.13	0.00
3	/ABS	0.00	0.00	84.55	0.00
3	/CQC	0.00	0.00	14.48	0.00
3	MODE 1	0.00	0.00	46.82	0.00
3	MODE 2	0.00	0.00	-37.73	0.00
4	/SRSS	0.00	0.00	52.92	0.00
4	/ABS	0.00	0.00	74.41	0.00
4	/CQC	0.00	0.00	12.74	0.00
4	MODE 1	0.00	0.00	-41.21	0.00
4	MODE 2	0.00	0.00	33.21	0.00

/TABS80 /SAMPLE EXAMPLE 4A PAGE 21
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM 06/06/80

LATERAL FRAME DISPLACEMENTS IN FRAME X1

LEVEL	/SRSS	/ABS	/CQC	MODE 1
ST-3	.812896	1.143018	1.132821	.632969
ST-2	.555170	.780628	.773664	.432288
ST-1	.257375	.361897	.358669	.200408

LATERAL FRAME DISPLACEMENTS IN FRAME X1

LEVEL	MODE 2
ST-3	.510049
ST-2	.348340
ST-1	.161489

/TABS80 /SAMPLE EXAMPLE 4A PAGE 22
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM 06/06/80

COLUMN FORCES AT LEVEL ST-1 IN FRAME X1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	200.55	0.00
1	/ABS	0.00	0.00	281.59	0.00
1	/CQC	0.00	0.00	279.47	0.00
1	MODE 1	0.00	0.00	156.16	0.00
1	MODE 2	0.00	0.00	125.83	0.00
2	/SRSS	0.00	0.00	.00	0.00
2	/ABS	0.00	0.00	.00	0.00
2	/CQC	0.00	0.00	.00	0.00
2	MODE 1	0.00	0.00	.00	0.00
2	MODE 2	0.00	0.00	.00	0.00
3	/SRSS	0.00	0.00	200.55	0.00
3	/ABS	0.00	0.00	281.59	0.00
3	/CQC	0.00	0.00	279.47	0.00
3	MODE 1	0.00	0.00	-156.16	0.00
3	MODE 2	0.00	0.00	-125.83	0.00

DIAGONAL FORCES AT LEVEL ST-1 IN FRAME X1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
9	/SRSS	0.00	0.00	86.48	0.00
9	/ABS	0.00	0.00	121.60	0.00
9	/CQC	0.00	0.00	120.52	0.00
9	MODE 1	0.00	0.00	-67.34	0.00
9	MODE 2	0.00	0.00	-54.26	0.00
10	/SRSS	0.00	0.00	139.57	0.00
10	/ABS	0.00	0.00	196.25	0.00
10	/CQC	0.00	0.00	194.50	0.00
10	MODE 1	0.00	0.00	108.68	0.00
10	MODE 2	0.00	0.00	87.57	0.00
11	/SRSS	0.00	0.00	139.57	0.00
11	/ABS	0.00	0.00	196.25	0.00
11	/CQC	0.00	0.00	194.50	0.00
11	MODE 1	0.00	0.00	-108.68	0.00
11	MODE 2	0.00	0.00	-87.57	0.00
12	/SRSS	0.00	0.00	86.48	0.00
12	/ABS	0.00	0.00	121.60	0.00
12	/CQC	0.00	0.00	120.52	0.00
12	MODE 1	0.00	0.00	67.34	0.00
12	MODE 2	0.00	0.00	54.26	0.00

/TABSBC /SAMPLE EXAMPLE 4A
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM

COLUMN FORCES AT LEVEL ST-2 IN FRAME X1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	100.28	0.00
1	/ABS	0.00	0.00	141.00	0.00
1	/CQC	0.00	0.00	139.75	0.00
1	MODE 1	0.00	0.00	78.08	0.00
1	MODE 2	0.00	0.00	62.92	0.00
2	/SRSS	0.00	0.00	.00	0.00
2	/ABS	0.00	0.00	.00	0.00
2	/CQC	0.00	0.00	.00	0.00
2	MODE 1	0.00	0.00	.00	0.00
2	MODE 2	0.00	0.00	.00	0.00
3	/SRSS	0.00	0.00	100.28	0.00
3	/ABS	0.00	0.00	141.00	0.00
3	/CQC	0.00	0.00	139.75	0.00
3	MODE 1	0.00	0.00	-78.08	0.00
3	MODE 2	0.00	0.00	-62.92	0.00

DIAGONAL FORCES AT LEVEL ST-2 IN FRAME X1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/SRSS	0.00	0.00	81.86	0.00
5	/ABS	0.00	0.00	115.10	0.00
5	/CQC	0.00	0.00	114.07	0.00
5	MODE 1	0.00	0.00	-63.74	0.00
5	MODE 2	0.00	0.00	-51.36	0.00
6	/SRSS	0.00	0.00	108.40	0.00
6	/ABS	0.00	0.00	152.42	0.00
6	/CQC	0.00	0.00	151.06	0.00
6	MODE 1	0.00	0.00	84.41	0.00
6	MODE 2	0.00	0.00	68.02	0.00
7	/SRSS	0.00	0.00	108.40	0.00
7	/ABS	0.00	0.00	152.42	0.00
7	/CQC	0.00	0.00	151.06	0.00
7	MODE 1	0.00	0.00	-84.41	0.00
7	MODE 2	0.00	0.00	-68.02	0.00
8	/SRSS	0.00	0.00	81.86	0.00
8	/ABS	0.00	0.00	115.10	0.00
8	/CQC	0.00	0.00	114.07	0.00
8	MODE 1	0.00	0.00	63.74	0.00
8	MODE 2	0.00	0.00	51.36	0.00

/TABSBC /SAMPLE EXAMPLE 4A
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM

COLUMN FORCES AT LEVEL ST-3 IN FRAME X1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	27.23	0.00
1	/ABS	0.00	0.00	38.29	0.00
1	/CQC	0.00	0.00	37.94	0.00
1	MODE 1	0.00	0.00	21.20	0.00
1	MODE 2	0.00	0.00	17.08	0.00
2	/SRSS	0.00	0.00	.00	0.00
2	/ABS	0.00	0.00	.00	0.00
2	/CQC	0.00	0.00	.00	0.00
2	MODE 1	0.00	0.00	.00	0.00
2	MODE 2	0.00	0.00	-.00	0.00
3	/SRSS	0.00	0.00	27.23	0.00
3	/ABS	0.00	0.00	38.29	0.00
3	/CQC	0.00	0.00	37.94	0.00
3	MODE 1	0.00	0.00	-21.20	0.00
3	MODE 2	0.00	0.00	-17.08	0.00

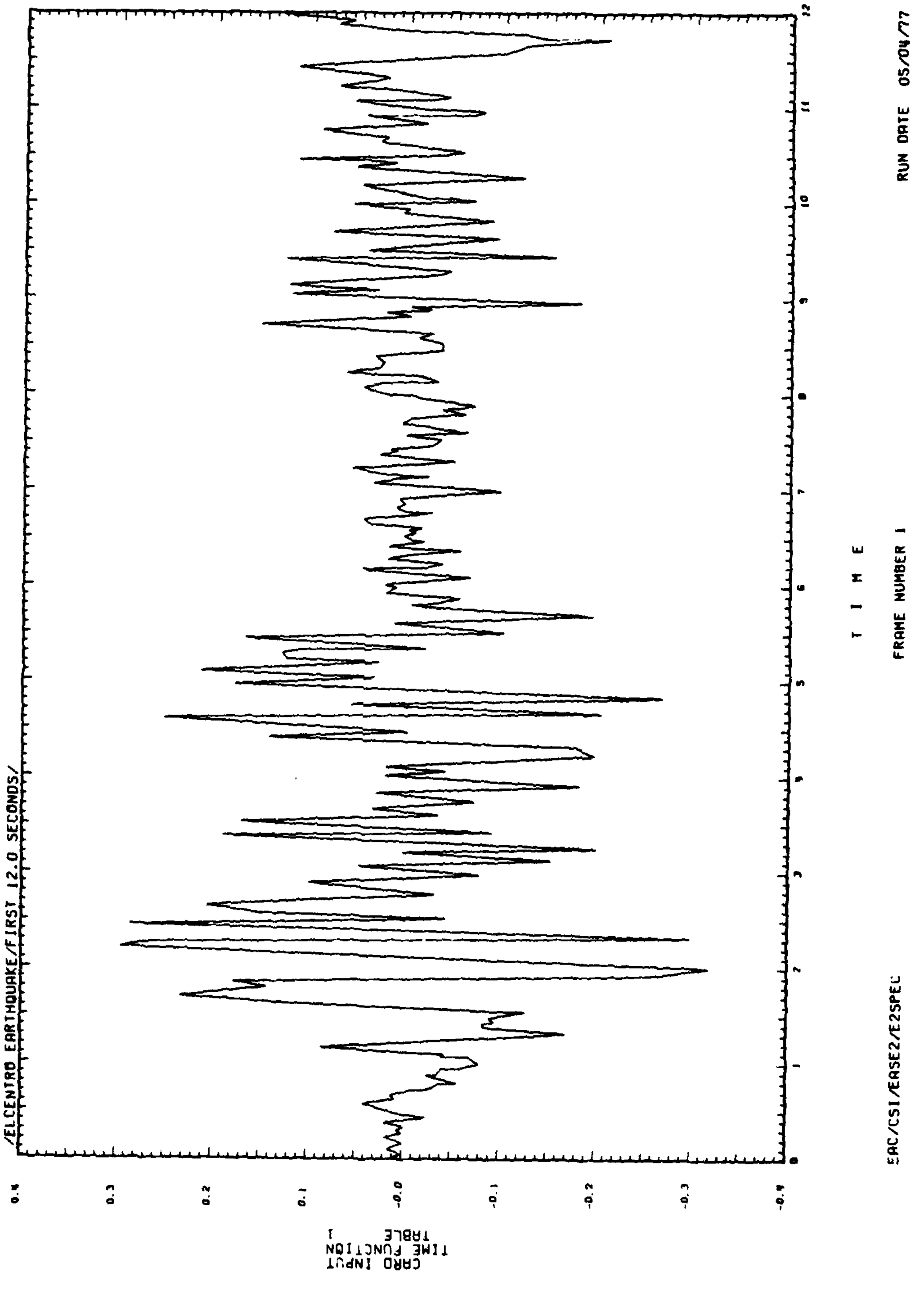
DIAGONAL FORCES AT LEVEL ST-3 IN FRAME X1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	0.00	0.00	52.92	0.00
1	/ABS	0.00	0.00	74.41	0.00
1	/CQC	0.00	0.00	73.75	0.00
1	MODE 1	0.00	0.00	-41.21	0.00
1	MODE 2	0.00	0.00	-33.21	0.00
2	/SRSS	0.00	0.00	60.13	0.00
2	/ABS	0.00	0.00	84.55	0.00
2	/CQC	0.00	0.00	83.79	0.00
2	MODE 1	0.00	0.00	46.82	0.00
2	MODE 2	0.00	0.00	37.73	0.00
3	/SRSS	0.00	0.00	60.13	0.00
3	/ABS	0.00	0.00	84.55	0.00
3	/CQC	0.00	0.00	83.79	0.00
3	MODE 1	0.00	0.00	-46.82	0.00
3	MODE 2	0.00	0.00	-37.73	0.00
4	/SRSS	0.00	0.00	52.92	0.00
4	/ABS	0.00	0.00	74.41	0.00
4	/CQC	0.00	0.00	73.75	0.00
4	MODE 1	0.00	0.00	41.21	0.00
4	MODE 2	0.00	0.00	33.21	0.00

```
TIME LOG (SECONDS)

FORM FRAME STIFFNESSES................. =     .14
SOLVE STATIC LOAD CASES................ =     .02
MODE SHAPES AND FREQUENCIES............ =     .12
COMPUTE FRAME DISPLACEMENTS............ =     .00
MEMBER FORCES AND STRESSES............. =     .53

TOTAL TIME............................. =     .82
```



/ELCENTRO EARTHQUAKE/FIRST 12.0 SECONDS/
0.4
0.3
0.2
0.1
-0.0
-0.1
-0.2
-0.3
-0.4
CARD INPUT
TIME FUNCTION
TABLE 1
0
1
2
3
4
5
6
7
8
9
10
11
12
T I M E
FRAME NUMBER 1
EAC/CSI/EASE2/E2SPEC
RUN DATE 05/04/77

```
/TABS80 /SAMPLE EXAMPLE 48                                                        PAGE     8
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY                       06/08/80

RESPONSE ANALYSIS DATA

ACCELERATION HISTORY HEADING../ELCENTRO EARTHQUAKE (12 SECS)

ACCELERATION INPUT FORMAT        (6F10.0)
NUMBER OF POINTS ON HISTORY           222
NUMBER OF OUTPUT TIMES                300
ACCELERATION SCALE FACTOR        386.4000
ANGLE OF EQ INCIDENCE             90.0000
TIME INCREMENT FOR OUTPUT           .0400
TIME HISTORY TYPE                       L
TIME STEP IF E-TYPE HISTORY        0.0000


/TABS80 /SAMPLE EXAMPLE 48                                                        PAGE     9
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY                       06/08/80

MODE     DAMPING
  1        .050
  2        .050


/TABS80 /SAMPLE EXAMPLE 48                                                        PAGE    11
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY                       06/08/80

GROUND ACCELERATION CARDS

            TIME     ACCELERATION
          0.0000             .011
           .0420             .001
           .0970             .016
           .1610            -.006
           .2210             .035
           .2630             .000
           .2910             .006
           .3320            -.001
           .3740             .020
           .4250            -.024
           .4710             .008
           .5810             .043
           .6230             .005
           .6650             .014
           .7200            -.005
           .7201            -.026
           .7890            -.035
           .7891            -.057
           .8720            -.023
           .8721            -.034
           .9410            -.040


/TABS80 /SAMPLE EXAMPLE 48                                                        PAGE    16
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY                       06/08/80

LOAD CASE DEFINITION DATA

  NO  IC     I    II   III    IV     A     B DYN-1 DYN-2 DYN-3  LOAD CASE ID

   1   0  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  1.00      /HISTORY


FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS  MODAL COMBINATION
DYNAMIC 3 . . . CQC  MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

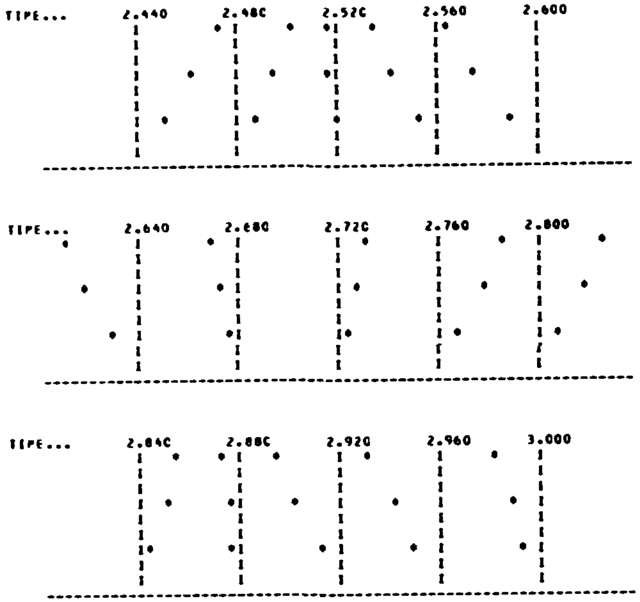

/TABS80 /SAMPLE EXAMPLE 48                                                        PAGE    17
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY                       06/08/80

LATERAL FRAME DISPLACEMENTS  IN FRAME Y1

LEVEL        /HISTORY
ST-3          .163607
ST-2          .111736
ST-1          .051800
```

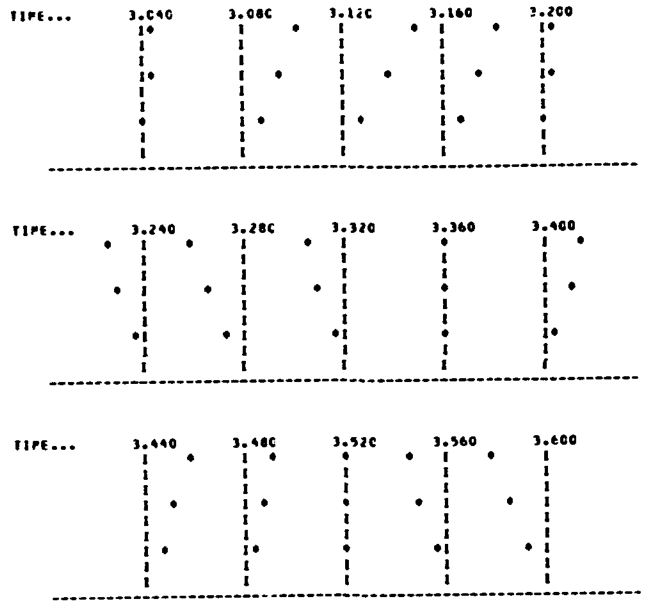
/TABSOC /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

FRAME DISPLACEMENT PLOT...FRAME Y1



/TABSOC /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

FRAME DISPLACEMENT PLOT...FRAME Y1



/TABSOC /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

SCALE - ONE INCH = .163607E+00 MAXIMUM AT T= .26000E+01

NOTE..PLOT IS OF DYNAMIC DISPLACEMENTS ONLY AND DOES NOT
INCLUDE ANY SCALING BY LOAD CASE DEFINITION CARDS

PAGE 39
06/08/80

/TABS80 /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

COLUMN FORCES AT LEVEL ST-1 IN FRAME Y1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	40.36	0.00
2	/HISTORY	0.00	0.00	.00	0.00
3	/HISTORY	0.00	0.00	40.36	0.00

DIAGONAL FORCES AT LEVEL ST-1 IN FRAME Y1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
9	/HISTORY	0.00	0.00	17.41	0.00
10	/HISTORY	0.00	0.00	28.09	0.00
11	/HISTORY	0.00	0.00	28.09	0.00
12	/HISTORY	0.00	0.00	17.41	0.00

PAGE 40
06/08/80

/TABS80 /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

COLUMN FORCES AT LEVEL ST-2 IN FRAME Y1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	20.18	0.00
2	/HISTORY	0.00	0.00	.00	0.00
3	/HISTORY	0.00	0.00	20.18	0.00

DIAGONAL FORCES AT LEVEL ST-2 IN FRAME Y1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/HISTORY	0.00	0.00	16.47	0.00
6	/HISTORY	0.00	0.00	21.82	0.00
7	/HISTORY	0.00	0.00	21.82	0.00
8	/HISTORY	0.00	0.00	16.47	0.00

PAGE 41
06/08/80

/TABS80 /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

COLUMN FORCES AT LEVEL ST-3 IN FRAME Y1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	5.48	0.00
2	/HISTORY	0.00	0.00	.00	0.00
3	/HISTORY	0.00	0.00	5.48	0.00

DIAGONAL FORCES AT LEVEL ST-3 IN FRAME Y1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	10.65	0.00
2	/HISTORY	0.00	0.00	12.10	0.00
3	/HISTORY	0.00	0.00	12.10	0.00
4	/HISTORY	0.00	0.00	10.65	0.00

PAGE 42
06/08/80

/TABS80 /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

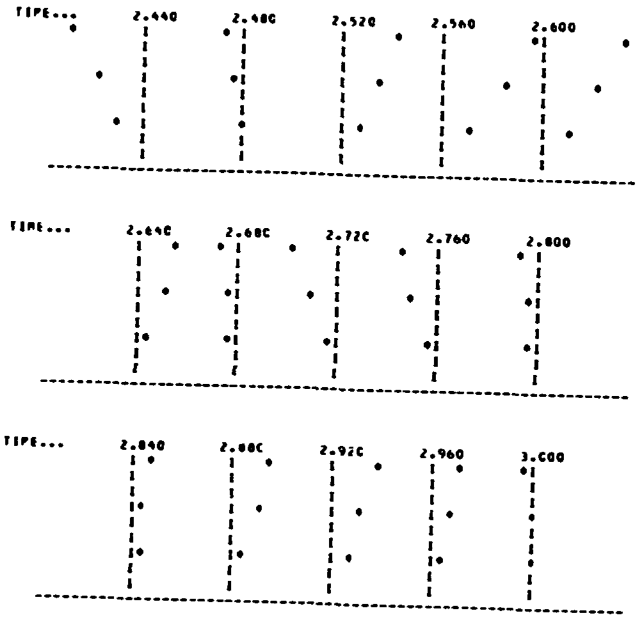
LATERAL FRAME DISPLACEMENTS IN FRAME X1

LEVEL	/HISTORY
ST-3	1.219098
ST-2	.832587
ST-1	.385985

/TABSBC /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

PAGE 47
06/08/8C

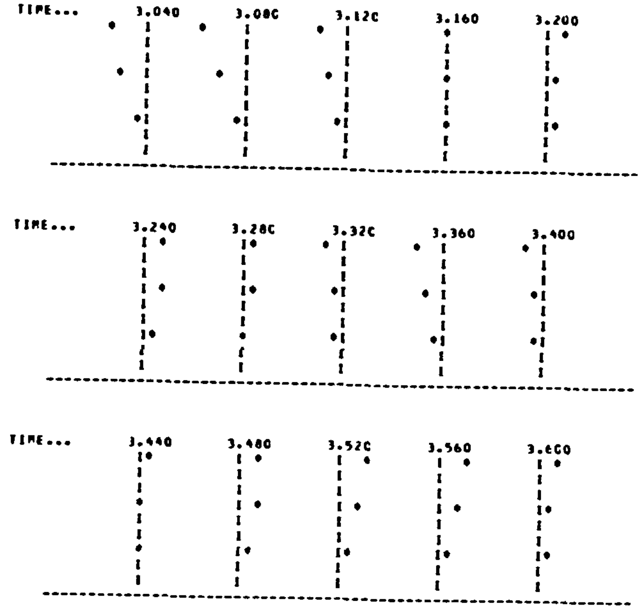
FRAME DISPLACEMENT PLOT...FRAME X1



/TABSBC /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

PAGE 48
06/08/8C

FRAME DISPLACEMENT PLOT...FRAME X1



/TABSBC /SAMPLE EXAMPLE 4B
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY

PAGE 63
06/08/8C

SCALE - ONE INCH = .121910E+01 MAXIMUM AT T= .25600E+01

NOTE..PLOT IS OF DYNAMIC DISPLACEMENTS ONLY AND DOES NOT
INCLUDE ANY SCALING BY LOAD CASE DEFINITION CARDS

/TABS80 /SAMPLE EXAMPLE 4B /BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY — PAGE 64 — 06/08/80

COLUMN FORCES AT LEVEL ST-1 IN FRAME X1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	300.76	0.00
2	/HISTORY	0.00	0.00	.00	0.00
3	/HISTORY	0.00	0.00	300.76	0.00

DIAGONAL FORCES AT LEVEL ST-1 IN FRAME X1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
9	/HISTORY	0.00	0.00	129.70	0.00
10	/HISTORY	0.00	0.00	209.31	0.00
11	/HISTORY	0.00	0.00	209.31	0.00
12	/HISTORY	0.00	0.00	129.70	0.00

/TABS80 /SAMPLE EXAMPLE 4B /BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY — PAGE 65 — 06/08/80

COLUMN FORCES AT LEVEL ST-2 IN FRAME X1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	150.39	0.00
2	/HISTORY	0.00	0.00	.00	0.00
3	/HISTORY	0.00	0.00	150.39	0.00

DIAGONAL FORCES AT LEVEL ST-2 IN FRAME X1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
5	/HISTORY	0.00	0.00	122.76	0.00
6	/HISTORY	0.00	0.00	162.57	0.00
7	/HISTORY	0.00	0.00	162.57	0.00
8	/HISTORY	0.00	0.00	122.76	0.00

/TABS80 /SAMPLE EXAMPLE 4B /BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY — PAGE 66 — 06/08/80

COLUMN FORCES AT LEVEL ST-3 IN FRAME X1

COLUMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	40.83	0.00
2	/HISTORY	0.00	0.00	.00	0.00
3	/HISTORY	0.00	0.00	40.83	0.00

DIAGONAL FORCES AT LEVEL ST-3 IN FRAME X1

DIAG NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	0.00	0.00	79.37	0.00
2	/HISTORY	0.00	0.00	90.18	0.00
3	/HISTORY	0.00	0.00	90.18	0.00
4	/HISTORY	0.00	0.00	79.37	0.00

/TABS80 /SAMPLE EXAMPLE 4B /BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY — PAGE 6E — 06/08/80

TIME LOG (SECONDS)

```
FORM FRAME STIFFNESSES................. =    .09
SOLVE STATIC LOAD CASES................ =    .01
MODE SHAPES AND FREQUENCIES............ =    .29
COMPUTE FRAME DISPLACEMENTS............ =    .09
MEMBER FORCES AND STRESSES............. =   4.08

TOTAL TIME............................. =   4.56
```

E. Example 5 (a and b)

(i) Description

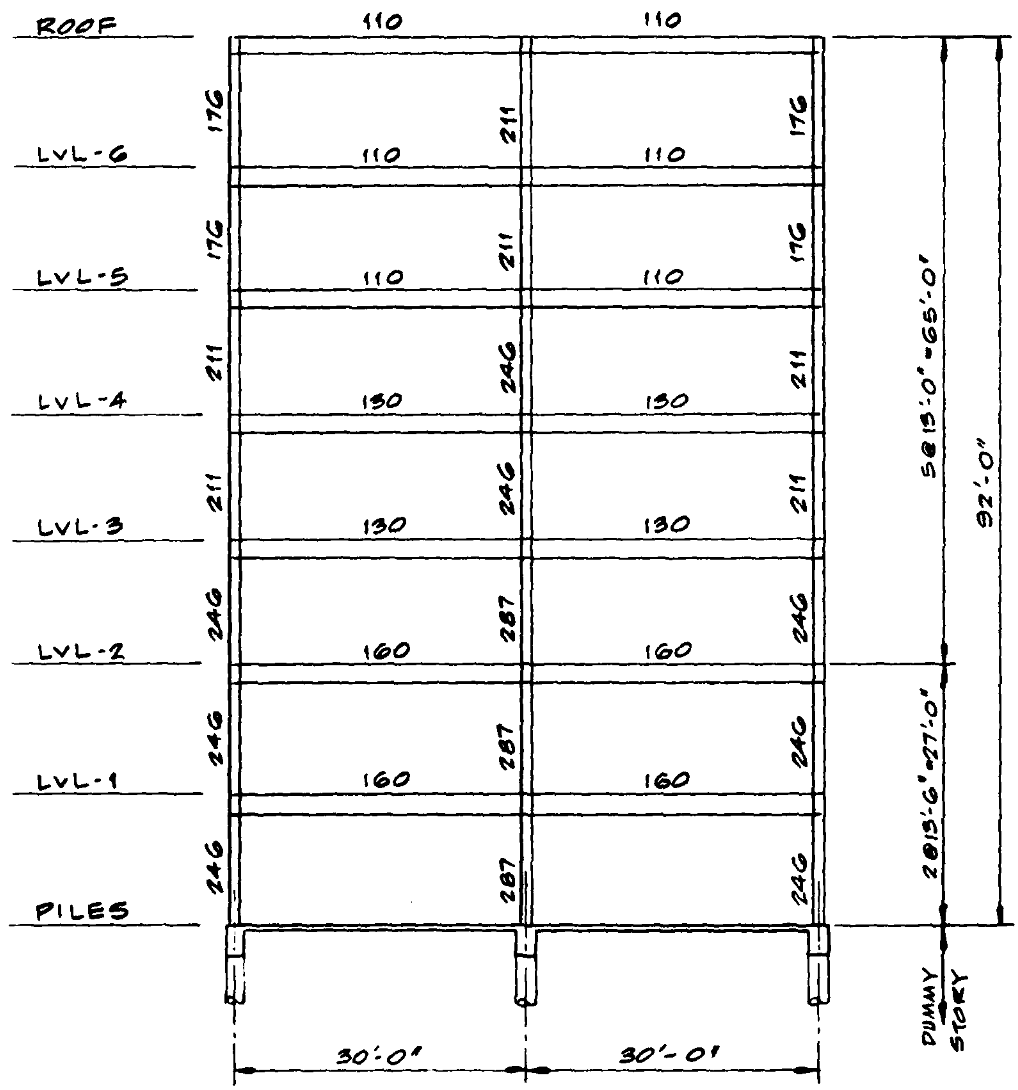
This seven story structure is a moment resisting frame subjected to dynamic response spectrum (5a) and time history (5b) loads.

(ii) Significant options of CTABS80 activated

1. Soil stiffness modeling with dummy story (PILES)
2. Response spectrum dynamics
3. Time history dynamics

(iii) Comments

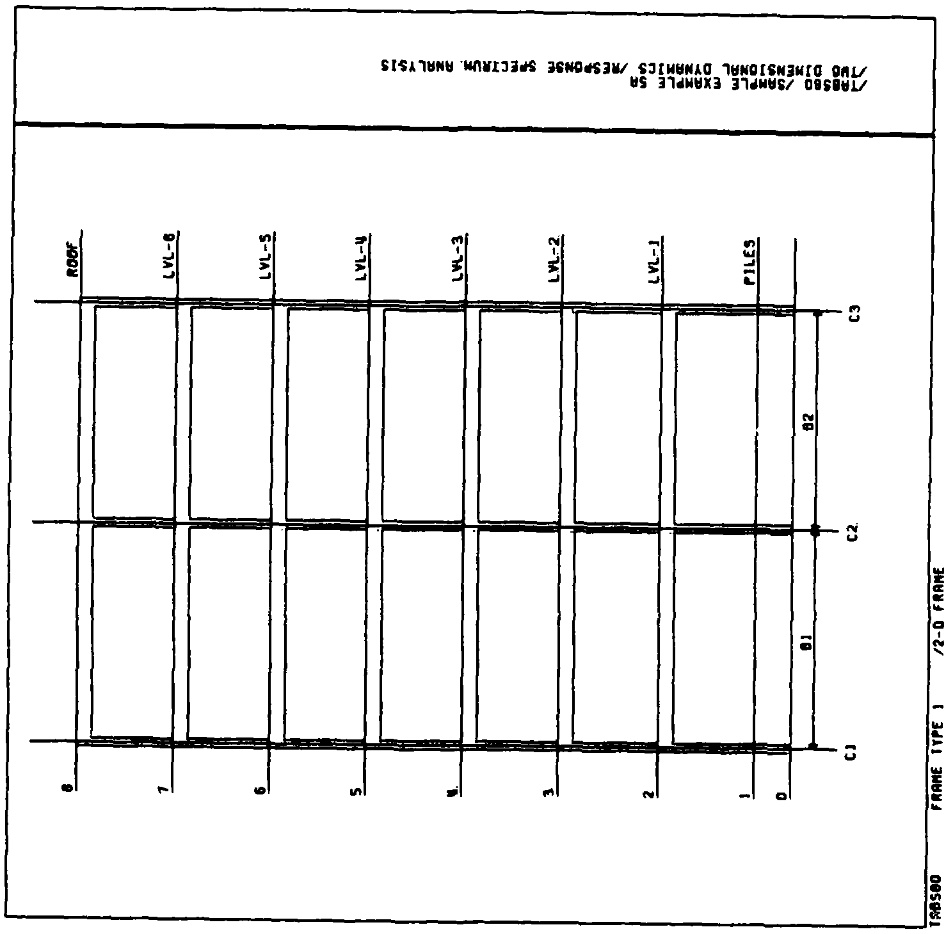
The time periods of this structure are well spread apart. In such situations the modal cross correlation matrix deflates to an identity matrix so that the CQC and SRSS techniques give virtually identical results as illustrated by the output of example 5a.



NOTE: MEMBER WEIGHTS ARE AS SHOWN
COLUMNS ARE W14'S
BEAMS ARE W24'S

FRAME ELEVATION

EXAMPLE 5



/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS
ROOF
LVL-6
LVL-5
LVL-4
LVL-3
LVL-2
LVL-1
PILES
8
7
6
5
4
3
2
1
0
C1
C2
C3
B1
B2
TABS80 FRAME TYPE 1 /2-D FRAME

TABS80 /SAMPLE EXAMPLE 5A
TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 1
06/06/80

TOTAL NUMBER OF STORIES IN STRUCTURE--------	8
NUMBER OF DIFFERENT FRAMES IN STRUCTURE-----	1
TOTAL NUMBER OF FRAMES IN STRUCTURE---------	1
TOTAL NUMBER OF STRUCTURAL LOAD CASES-------	3
TYPE OF ANALYSIS----------------------------	3
NUMBER OF MODES CONSIDERED------------------	8
LATERAL STORY TRANSLATION CODE--------------	1
EXECUTION MODE------------------------------	0
FRAME JOINT RIGID ZONE MODIFICATION CODE----	0
FRAME JOINT DISPLACEMENT PRINT FLAG---------	0
UBC LATERAL SEISMIC FORCE CODE--------------	0
NUMBER OF STORY MASS PATTERNS---------------	0
MASTER PEN PLOT FLAG------------------------	2

CONVERSION DATA FOR STRESSES

LENGTH CONVERSION FACTOR--------------------	1.000
FORCE CONVERSION FACTOR---------------------	1.000

/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 2
06/06/80

STRUCTURAL STORY DATA . . .

LEVEL	MASS TYPE	HEIGHT	K-X	K-Y	K-ROTN
ROOF	0	156.00	0.	0.	0.
LVL-6	0	156.00	0.	0.	0.
LVL-5	0	156.00	0.	0.	0.
LVL-4	0	156.00	0.	0.	0.
LVL-3	0	156.00	0.	0.	0.
LVL-2	0	162.00	0.	0.	0.
LVL-1	0	156.00	0.	0.	0.
PILES	0	60.00	0.	0.	0.

STRUCTURAL MASS DATA . . .

LEVEL	MASS	MMI	XM	YM
ROOF	.473	0.0	0.00	0.00
LVL-6	.487	0.0	0.00	0.00
LVL-5	.487	0.0	0.00	0.00
LVL-4	.487	0.0	0.00	0.00
LVL-3	.487	0.0	0.00	0.00
LVL-2	.487	0.0	0.00	0.00
LVL-1	.515	0.0	0.00	0.00
PILES	1.250	0.0	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION A . . .

LEVEL	FX	FY	X	Y
ROOF	0.00	0.00	0.00	0.00
LVL-6	0.00	0.00	0.00	0.00
LVL-5	0.00	0.00	0.00	0.00
LVL-4	0.00	0.00	0.00	0.00
LVL-3	0.00	0.00	0.00	0.00
LVL-2	0.00	0.00	0.00	0.00
LVL-1	0.00	0.00	0.00	0.00
PILES	0.00	0.00	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION B . . .

LEVEL	FX	FY	X	Y
ROOF	0.00	0.00	0.00	0.00
LVL-6	0.00	0.00	0.00	0.00
LVL-5	0.00	0.00	0.00	0.00
LVL-4	0.00	0.00	0.00	0.00
LVL-3	0.00	0.00	0.00	0.00
LVL-2	0.00	0.00	0.00	0.00
LVL-1	0.00	0.00	0.00	0.00
PILES	0.00	0.00	0.00	0.00

```
/TABS80 /SAMPLE EXAMPLE 5A                                          PAGE  100
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS                04/09/81

/2-D FRAME

FRAME IDENTIFICATION NUMBER------------------          1
NUMBER OF COLUMN LINES IN FRAME--------------          3
NUMBER OF STORY LEVELS IN FRAME--------------          8
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES---          5
NUMBER OF BEAM PROPERTIES--------------------          4
NUMBER OF BEAM SPAN LOADING PATTERNS---------          0
MAXIMUM POINT LOADS IN ANY SPAN LOADING------          0
NUMBER OF PANEL ELEMENTS IN FRAME------------          0
NUMBER OF DIAGONAL ELEMENTS IN FRAME---------          0
FRAME PEN PLOT FLAG--------------------------          0
STORY CONNECTIVITY CODE----------------------          0

BAY WIDTHS
    360.00      360.00

SILL DEPTHS
      0.00        0.00

COLUMN SECTION PROPERTY DATA

  ID       U         E          A          I          AV      W       T
   1    0.000    29000.0   .512E+02   .215E+04    12.50  14.00   0.00
   2    0.000    29000.0   .621E+02   .267E+04    15.40  14.00   0.00
   3    0.000    29000.0   .723E+02   .323E+04    18.30  14.00   0.00
   4    0.000    29000.0   .844E+02   .391E+04    22.00  14.00   0.00
   5    0.000    29000.0   .600E+04   .100E+07    20.00  14.00   0.00

BEAM SECTION PROPERTY DATA

  ID       U         E          I         K       C     DB      DA       AV      T
   1    0.000    29000.0   .333E+04    4.00    .50  24.00   0.00     0.00   0.00
   2    0.000    29000.0   .402E+04    4.00    .50  24.00   0.00     0.00   0.00
   3    0.000    29000.0   .512E+04    4.00    .50  24.00   0.00     0.00   0.00
   4    0.000    29000.0   .220E+05    4.00    .50   0.00   0.00     0.00   0.00

INPUT/GENERATED COLUMN LOCATIONS

LEVEL     1   2   3

ROOF      1   2   1
LVL-6     1   2   1
LVL-5     2   3   2
LVL-4     2   3   2
LVL-3     3   4   3
LVL-2     3   4   3
LVL-1     3   4   3
```

```
/TABS80 /SAMPLE EXAMPLE 5A                                          PAGE  101
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS                04/09/81

LEVEL     1   2   3

PILES     5   5   5

INPUT/GENERATED BEAM LOCATIONS

LEVEL     1   2

ROOF      1   1
LVL-6     1   1
LVL-5     1   1
LVL-4     2   2
LVL-3     2   2
LVL-2     3   3
LVL-1     3   3
PILES     4   4

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

   LEVEL/---------VERTICAL LOAD COND---------/
     ID         I        II       III       IV

   ROOF      0.00     0.00     0.00     0.00
   LVL-6     0.00     0.00     0.00     0.00
   LVL-5     0.00     0.00     0.00     0.00
   LVL-4     0.00     0.00     0.00     0.00
   LVL-3     0.00     0.00     0.00     0.00
   LVL-2     0.00     0.00     0.00     0.00
   LVL-1     0.00     0.00     0.00     0.00
   PILES     0.00     0.00     0.00     0.00

FRAME NO.=     1
TIME     =   .09
```

```
/TABS80 /SAMPLE EXAMPLE 5A                                          PAGE  102
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS                04/09/81

FRAME LOCATION DATA

FRAME FRAME PRINT
  NO   TYPE  CODE      X1        Y1        X2        Y2   /--FRAME LOCATION--/

   1     1     0      0.00      0.00     10.00      0.00  /FRAME OF EXAMPLE 5A
```

MODE NUMBER	TIME PERIOD
1	1.2332
2	.4166
3	.2333
4	.1544
5	.1140
6	.0905
7	.0754
8	.0613

MODE SHAPES

LEVEL	DIRN	1	2	3	4
ROOF	X	.797675	.758007	-.657640	.536065
LVL-6	X	.740440	.364981	.179644	-.632502
LVL-5	X	.642019	-.168703	.737670	-.414161
LVL-4	X	.518404	-.582198	.449826	.588259
LVL-3	X	.376794	-.733651	-.302041	.476922
LVL-2	X	.234770	-.609970	-.722184	-.437085
LVL-1	X	.092699	-.281831	-.476430	-.639380
PILES	X	.003670	-.012518	-.026057	-.047684

MODE SHAPES

LEVEL	DIRN	5	6	7	8
ROOF	X	.367439	.210967	.062672	-.001547
LVL-6	X	-.745873	-.582195	-.210421	.006355
LVL-5	X	.366850	.768331	.414545	-.017237
LVL-4	X	.443266	-.543843	-.635173	.040055
LVL-3	X	-.648927	-.047089	.789840	-.085540
LVL-2	X	-.114129	.580805	-.732050	.165402
LVL-1	X	.742878	-.625638	.439980	-.286026
PILES	X	.081717	-.112398	.159805	.867196

MODAL PARTICIPATION FACTORS

MODE NUMBER	P-FACTOR DIRECTION	P-FACTOR VALUE
1	X	1.65318
2	X	-.64454
3	X	-.42200
4	X	-.33927
5	X	.31821
6	X	-.27689
7	X	.27421
8	X	.58511

ACCELERATION SPECTRUM /ELCENTRO EARTHQUAKE

NO OF PERIOD CARDS = 51
NO OF SEPARATE MODES = 0
SCALE FACTOR = 386.400
ANGLE OF EQ INCIDENCE = 50.000
STRUCTURAL DAMPING = .050

PERIOD	ACCELERATION
0.000	.328
.026	.330
.027	.330
.028	.343
.029	.354
.029	.363
.030	.368
.031	.368
.032	.363
.033	.360
.035	.364
.036	.363
.037	.361
.039	.359
.040	.355
.042	.346
.044	.344
.046	.347
.048	.353
.050	.354
.053	.354
.056	.355
.059	.392
.063	.431
.067	.446
.071	.478
.077	.505
.083	.518
.091	.478
.097	.553
.100	.582
.102	.585
.107	.555
.113	.529
.120	.595
.127	.637
.136	.662
.146	.629
.158	.871
.171	.817
.187	.988
.206	.970

PERIOD	ACCELERATION
.230	.701
.260	.858
.299	.739
.351	.871
.426	.909
.541	.982
.741	.476
1.177	.271
2.057	.198

GENERATED MODAL SPECTRAL ACCELERATION VALUES

MODE NUMBER	SPECTRAL ACCELERATION
1	103.879
2	349.458
3	277.671
4	317.300
5	208.201
6	185.379
7	192.381
8	262.439

MAXIMUM MODAL INERTIA LOADS/TORSIONS
GENERATED IN EACH LEVEL (AT CENTER OF MASS)

LEVEL	DIRN	1	2	3	4
ROOF	X	64.79	-80.76	36.45	-27.29
LVL-6	X	61.93	-40.04	-10.25	33.15
LVL-5	X	53.69	18.51	-42.09	21.71
LVL-4	X	43.36	63.86	-25.67	-30.83
LVL-3	X	31.51	80.48	17.24	-25.00
LVL-2	X	19.63	66.91	41.21	22.91
LVL-1	X	8.20	32.69	28.75	35.44
PILES	X	.79	3.52	3.82	6.41

MAXIMUM MODAL INERTIA LOADS/TORSIONS
GENERATED IN EACH LEVEL (AT CENTER OF MASS)

LEVEL	DIRN	5	6	7	8
ROOF	X	11.51	-5.12	1.56	-.12
LVL-6	X	-24.06	14.55	-5.41	.45
LVL-5	X	11.84	-19.21	10.65	-1.33
LVL-4	X	14.30	13.59	-16.32	3.11
LVL-3	X	-20.94	1.18	20.29	-6.65
LVL-2	X	-3.68	-14.52	-18.81	12.86
LVL-1	X	25.35	16.52	11.95	-23.52
PILES	X	6.77	7.21	10.54	173.09

MAXIMUM MODAL STORY SHEARS AT EACH LEVEL

LEVEL	DIRN	1	2	3	4
ROOF	X	64.79	-80.76	36.45	-27.29
LVL-6	X	126.72	-120.79	26.20	5.86
LVL-5	X	180.41	-102.29	-15.90	27.57
LVL-4	X	223.77	-38.42	-41.57	-3.26
LVL-3	X	255.28	42.05	-24.33	-28.26
LVL-2	X	274.92	108.96	16.88	-5.35
LVL-1	X	283.11	141.65	45.63	30.09
PILES	X	283.90	145.18	49.45	36.50

MAXIMUM MODAL STORY SHEARS AT EACH LEVEL

LEVEL	DIRN	5	6	7	8
ROOF	X	11.51	-5.12	1.56	-.12
LVL-6	X	-12.55	9.43	-3.84	.38
LVL-5	X	-.71	-9.77	6.81	-.96
LVL-4	X	13.59	3.82	-9.51	2.16
LVL-3	X	-7.35	5.00	10.78	-4.45
LVL-2	X	-11.03	-9.52	-8.03	8.37
LVL-1	X	14.31	7.00	3.93	-15.15
PILES	X	21.08	14.21	14.47	157.94

/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 13
06/06/80

LOAD CASE DEFINITION DATA

NO	IC	I	II	III	IV	A	B	DYN-1	DYN-2	DYN-3	LOAD CASE ID
1	0	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	/SRSS
2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	/ABS
3	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	/CQC

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS MODAL COMBINATION
DYNAMIC 3 . . . CQC MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 14
06/06/80

LATERAL FRAME DISPLACEMENTS IN /FRAME OF EXAMPLE 5A

LEVEL	/SRSS	/ABS	/CQC
ROOF	5.330844	6.178876	5.325689
LVL-6	4.911558	5.353577	4.909147
LVL-5	4.251965	4.579614	4.252694
LVL-4	3.478305	4.137399	3.481554
LVL-3	2.596036	3.320556	2.601785
LVL-2	1.670621	2.318719	1.675895
LVL-1	.679599	1.641274	.682915
PILES	.030822	.061346	.031210

/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 16
06/06/80

COLUMN FORCES AT LEVEL LVL-1 IN /FRAME OF EXAMPLE 5A

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	9209.97	2806.14	270.72	90.75
1	/ABS	14867.24	5481.15	306.02	154.15
1	/CQC	9260.40	2837.32	270.53	91.35
2	/SRSS	12538.40	6629.32	.00	140.55
2	/ABS	20071.76	10627.30	.00	232.57
2	/CQC	12605.42	6675.30	.00	141.40
3	/SRSS	9209.97	2806.14	270.72	90.75
3	/ABS	14867.24	5481.15	306.02	154.15
3	/CQC	9260.40	2837.32	270.53	91.35

BEAM FORCES AT LEVEL LVL-1 IN /FRAME OF EXAMPLE 5A

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SRSS	10073.43	9389.41	342.23	56.25	56.25
1	/ABS	14598.54	13570.44	514.11	81.41	81.41
1	/CQC	10111.34	9424.34	343.73	56.46	56.46
2	/SRSS	9389.41	10073.43	342.23	56.25	56.25
2	/ABS	13570.44	14598.54	514.11	81.41	81.41
2	/CQC	9424.34	10111.34	343.73	56.46	56.46

STORY SHEAR	LOAD CONDITIONS I	II	III	IV	A	B
	0.00	0.00	0.00	0.00	0.00	0.00

/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 17
06/06/80

COLUMN FORCES AT LEVEL LVL-2 IN /FRAME OF EXAMPLE 5A

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	5695.99	5044.41	223.35	77.36
1	/ABS	8431.32	8056.41	274.47	117.57
1	/CQC	5708.92	5066.97	223.64	77.59
2	/SRSS	10360.47	5288.29	.00	142.14
2	/ABS	14918.57	13901.32	.00	207.92
2	/CQC	10384.41	5321.13	.00	142.54
3	/SRSS	5695.99	5044.41	223.35	77.36
3	/ABS	8431.32	8056.41	274.47	117.57
3	/CQC	5708.92	5066.97	223.64	77.59

BEAM FORCES AT LEVEL LVL-2 IN /FRAME OF EXAMPLE 5A

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SRSS	10811.35	10176.76	317.30	60.66	60.66
1	/ABS	14169.49	13307.94	431.04	79.41	79.41
1	/CQC	10828.33	10192.71	317.51	60.75	60.75
2	/SRSS	10176.76	10811.35	317.30	60.66	60.66
2	/ABS	13307.94	14169.49	431.04	79.41	79.41
2	/CQC	10192.71	10828.33	317.51	60.75	60.75

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	0.00

/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 22
06/06/80

COLUMN FORCES AT LEVEL ROOF IN /FRAME OF EXAMPLE 5A

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/SRSS	1395.53	2473.04	16.61	28.48
1	/ABS	3132.65	4536.63	31.60	58.10
1	/CQC	1395.45	2449.01	16.63	28.04
2	/SRSS	3118.29	4442.60	.00	56.94
2	/ABS	6491.73	8213.54	.00	111.40
2	/CQC	3064.38	4398.16	.00	56.21
3	/SRSS	1395.53	2473.04	16.61	28.48
3	/ABS	3132.65	4536.63	31.60	58.10
3	/CQC	1395.45	2449.01	16.63	28.04

BEAM FORCES AT LEVEL ROOF IN /FRAME OF EXAMPLE 5A

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/SRSS	3030.49	2784.69	123.22	16.81	16.81
1	/ABS	5709.87	5222.44	243.72	31.60	31.60
1	/CQC	2997.88	2755.22	121.62	16.63	16.63
2	/SRSS	2784.69	3030.49	123.22	16.81	16.81
2	/ABS	5222.44	5709.87	243.72	31.60	31.60
2	/CQC	2755.22	2997.88	121.62	16.63	16.63

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	0.00

FRAME NO. = 1
STRESS TIME= .53

/TABS80 /SAMPLE EXAMPLE 5A
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS

PAGE 24
06/06/80

TIME LOG (SECONDS)

FORM FRAME STIFFNESSES.................	=	.22
SOLVE STATIC LOAD CASES................	=	.01
MODE SHAPES AND FREQUENCIES............	=	.15
COMPUTE FRAME DISPLACEMENTS............	=	.01
MEMBER FORCES AND STRESSES.............	=	.57
TOTAL TIME.............................	=	.95

```
/TABS80 /SAMPLE EXAMPLE 5B                                        PAGE    7
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS                 06/06/80

TOTAL NUMBER OF STORIES IN STRUCTURE--------              8
NUMBER OF DIFFERENT FRAMES IN STRUCTURE-----              1
TOTAL NUMBER OF FRAMES IN STRUCTURE---------              1
TOTAL NUMBER OF STRUCTURAL LOAD CASES-------              1
TYPE OF ANALYSIS----------------------------              4
NUMBER OF MODES CONSIDERED------------------              8
LATERAL STORY TRANSLATION CODE--------------              1
EXECUTION MODE------------------------------              0
FRAME JOINT RIGID ZONE MODIFICATION CODE----              0
FRAME JOINT DISPLACEMENT PRINT FLAG---------              0
UBC LATERAL SEISMIC FORCE CODE--------------              0
NUMBER OF STORY PASS PATTERNS---------------              0
MASTER PEN PLOT FLAG------------------------              0

CONVERSION DATA FOR STRESSES

LENGTH CONVERSION FACTOR--------------------           1.000
FORCE  CONVERSION FACTOR--------------------           1.000
```

```
/TABS80 /SAMPLE EXAMPLE 5B                                        PAGE    8
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS                 06/06/80

RESPONSE ANALYSIS DATA

ACCELERATION HISTORY HEADING../ELCENTRO EARTHQUAKE (12 SECS)

ACCELERATION INPUT FORMAT          (6F10.0)
NUMBER OF POINTS ON HISTORY             222
NUMBER OF OUTPUT TIMES                  150
ACCELERATION SCALE FACTOR          386.4000
ANGLE OF EQ INCIDENCE               90.0000
TIME INCREMENT FOR OUTPUT             .0800
TIME HISTORY TYPE                         U
TIME STEP IF E-TYPE HISTORY          0.0000
```

```
/TABS80 /SAMPLE EXAMPLE 5B                                        PAGE    9
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS                 06/06/80

MODE    DAMPING
  1       .050
  2       .050
  3       .050
  4       .050
  5       .050
  6       .050
  7       .050
  8       .050
```

/TABS80 /SAMPLE EXAMPLE 58 PAGE 11
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS 06/06/80

GROUND ACCELERATION CARDS

TIME	ACCELERATION
0.0000	.011
.0420	.001
.0970	.016
.1610	-.000
.2210	.019
.2630	.000
.2910	.008
.3320	-.001
.3740	.020
.4290	-.024
.4710	.008
.5810	.043
.6230	.009
.6650	.014
.7200	-.009
.7201	-.028
.7890	-.039
.7891	-.057
.8720	-.023
.8721	-.034
.9410	-.040
.9411	-.060
.9970	-.075
1.0660	-.067
1.0661	-.038
1.0940	-.043
1.1680	.090
1.3150	-.170
1.3840	-.083
1.4120	-.083
1.4400	-.095
1.4810	-.089
1.5090	-.108
1.5370	-.128
1.6280	.114
1.7030	.236
1.8000	.143
1.8550	.178
1.9240	-.261
2.0070	-.319
2.2150	.295
2.2700	.263
2.3200	-.298
2.3950	.005
2.4500	.287
2.5190	-.047
2.5750	.152
2.6520	.208

/TABS80 /SAMPLE EXAMPLE 58 PAGE 16
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS 06/06/80

LOAD CASE DEFINITION DATA

NO	IC	I	II	III	IV	A	B	DYN-1	DYN-2	DYN-3	LOAD CASE ID
1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	/HISTORY

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS MODAL COMBINATION
DYNAMIC 3 . . . CQC MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

/TABS80 /SAMPLE EXAMPLE 58 PAGE 17
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS 06/06/80

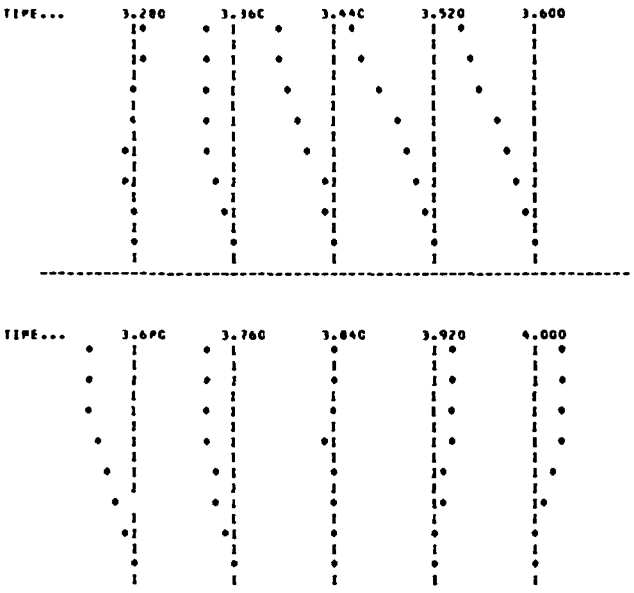
LATERAL FRAME DISPLACEMENTS IN /FRAME OF EXAMPLE 58

LEVEL	/HISTORY
ROOF	5.483591
LVL-6	4.992946
LVL-5	4.185883
LVL-4	3.321915
LVL-3	2.422919
LVL-2	1.511921
LVL-1	.600925
PILES	.028064

/TABS80 /SAMPLE EXAMPLE 5B
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS

PAGE 22
06/06/80

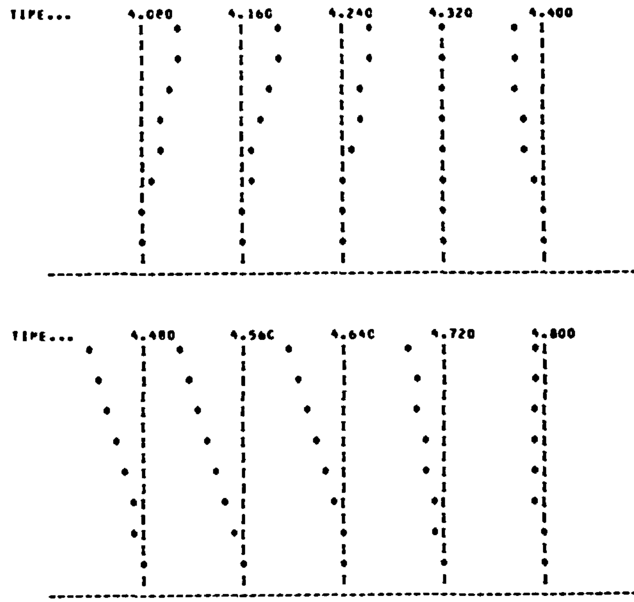
FRAME DISPLACEMENT PLOT.../FRAME OF EXAMPLE 5B



/TABS80 /SAMPLE EXAMPLE 5B
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS

PAGE 23
06/06/80

FRAME DISPLACEMENT PLOT.../FRAME OF EXAMPLE 5B



/TABS80 /SAMPLE EXAMPLE 5B
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS

PAGE 33
06/06/80

SCALE - ONE INCH = .548355E+01 MAXIMUM AT T= .60000E+01

NOTE..PLOT IS OF DYNAMIC DISPLACEMENTS ONLY AND DOES NOT
INCLUDE ANY SCALING BY LOAD CASE DEFINITION CARDS

/TABS80 /SAMPLE EXAMPLE 5B
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS

PAGE 35
06/06/80

COLUMN FORCES AT LEVEL LVL-1 IN /FRAME OF EXAMPLE 5B

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	8026.56	2302.59	276.55	77.91
2	/HISTORY	10942.15	5106.36	.00	121.44
3	/HISTORY	8026.56	2302.59	276.55	77.91

BEAM FORCES AT LEVEL LVL-1 IN /FRAME OF EXAMPLE 5B

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/HISTORY	8579.58	8376.75	301.42	50.16	50.16
2	/HISTORY	8376.75	8579.58	301.42	50.16	50.16

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	0.00

/TABS80 /SAMPLE EXAMPLE 5B
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS

PAGE 41
06/06/80

COLUMN FORCES AT LEVEL ROOF IN /FRAME OF EXAMPLE 5B

COLMN NO	LOAD IDENTIFICATION	BOTTOM MOMENT	TOP MOMENT	AXIAL FORCE	SHEAR FORCE
1	/HISTORY	1437.75	2915.80	19.80	32.98
2	/HISTORY	3570.49	5237.07	.00	66.72
3	/HISTORY	1437.75	2915.80	19.80	32.98

BEAM FORCES AT LEVEL ROOF IN /FRAME OF EXAMPLE 5B

BEAM NO	LOAD IDENTIFICATION	LEFT MOMENT	RIGHT MOMENT	SPAN MOMENT	LEFT SHEAR	RIGHT SHEAR
1	/HISTORY	3568.79	3280.65	144.07	19.80	19.80
2	/HISTORY	3280.65	3568.79	144.07	19.80	19.80

STORY SHEAR /--------------------LOAD CONDITIONS--------------------/

I	II	III	IV	A	B
0.00	0.00	0.00	0.00	0.00	0.00

FRAME NO. = 1
STRESS TIME= 1.71

/TABS80 /SAMPLE EXAMPLE 5B
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS

PAGE 43
06/06/80

TIME LOG (SECONDS)

FORM FRAME STIFFNESSES.................. = .15
SOLVE STATIC LOAD CASES................. = .01
MODE SHAPES AND FREQUENCIES............. = .46
COMPUTE FRAME DISPLACEMENTS............. = .02
MEMBER FORCES AND STRESSES.............. = 2.12

TOTAL TIME.............................. = 2.77

F. Example 6

(i) Description

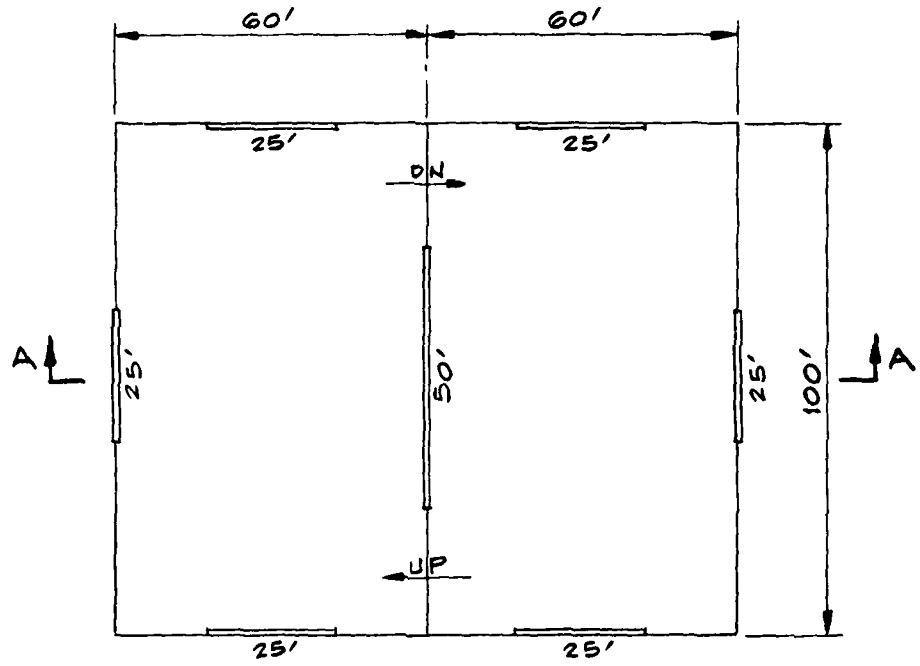
This structure is a 4-story concrete block shear wall parking garage with partial diaphragms. Wall type 3 engages all diaphragms, where all other walls connect only to the two levels associated with the corresponding segment of the structure.

(ii) Significant option of CTABS80 activated

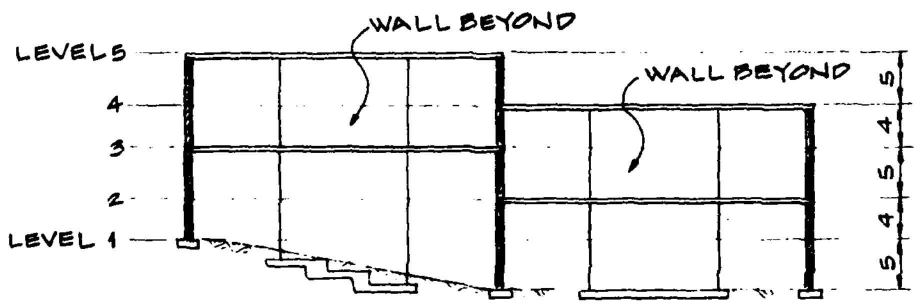
1. Frame/story special connectivity
2. Partial diaphragm modeling
3. Modeling of walls having bases at different elevations.

(iii) Comments

Level 1 is a dummy level for base fixity of higher walls. Wall types 1 and 3 do not connect to this level. A zero story height in the story data will model a condition where two diaphragms exist separately at the same level. In other words if the story height of level 4 is input as 0 (instead of 4) it will be established at the same elevation as level 3.



PLAN



SECTION A-A

ALL WALLS ARE 8" CONCRETE

EXAMPLE 6

/TABS80 /SAMPLE EXAMPLE 6
/DISCONTINUOUS FLOOR DIAPHRAGMS /SPECIAL STORY LEVEL CONNECTIVITY PAGE 1
04/09/81

TOTAL NUMBER OF STORIES IN STRUCTURE--------	5
NUMBER OF DIFFERENT FRAMES IN STRUCTURE-----	3
TOTAL NUMBER OF FRAMES IN STRUCTURE---------	7
TOTAL NUMBER OF STRUCTURAL LOAD CASES-------	2
TYPE OF ANALYSIS----------------------------	0
NUMBER OF MODES CONSIDERED------------------	0
LATERAL STORY TRANSLATION CODE--------------	0
EXECUTION MODE------------------------------	0
FRAME JOINT RIGID ZONE MODIFICATION CODE----	0
FRAME JOINT DISPLACEMENT PRINT FLAG---------	0
UBC LATERAL SEISMIC FORCE CODE--------------	0
NUMBER OF STORY MASS PATTERNS---------------	0
MASTER PEN PLOT FLAG------------------------	0

CONVERSION DATA FOR STRESSES

LENGTH CONVERSION FACTOR--------------------	1.000
FORCE CONVERSION FACTOR---------------------	1.000

/TABS80 /SAMPLE EXAMPLE 6
/DISCONTINUOUS FLOOR DIAPHRAGMS /SPECIAL STORY LEVEL CONNECTIVITY PAGE 2
04/09/81

STRUCTURAL STORY DATA . . .

LEVEL	MASS TYPE	HEIGHT	K-X	K-Y	K-ROTN
LEV 5	0	5.00	0.	0.	0.
LEV 4	0	4.00	0.	0.	0.
LEV 3	0	5.00	0.	0.	0.
LEV 2	0	4.00	0.	0.	0.
LEV 1	0	5.00	0.	0.	0.

STRUCTURAL MASS DATA . . .

LEVEL	MASS	MMI	XM	YM
LEV 5	0.000	0.0	0.00	0.00
LEV 4	0.000	0.0	0.00	0.00
LEV 3	0.000	0.0	0.00	0.00
LEV 2	0.000	0.0	0.00	0.00
LEV 1	0.000	0.0	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION A . . .

LEVEL	FX	FY	X	Y
LEV 5	320.00	0.00	-30.00	0.00
LEV 4	320.00	0.00	30.00	0.00
LEV 3	160.00	0.00	-30.00	0.00
LEV 2	160.00	0.00	30.00	0.00
LEV 1	0.00	0.00	0.00	0.00

STRUCTURAL LATERAL LOAD CONDITION B . . .

LEVEL	FX	FY	X	Y
LEV 5	0.00	320.00	-30.00	0.00
LEV 4	0.00	320.00	30.00	0.00
LEV 3	0.00	160.00	-30.00	0.00
LEV 2	0.00	160.00	30.00	0.00
LEV 1	0.00	0.00	0.00	0.00

AD-A105 513 COMPUTERS/STRUCTURES INTERNATIONAL OAKLAND CA F/G 13/13
USER'S GUIDE: COMPUTER PROGRAM FOR THREE-DIMENSIONAL ANALYSIS O--ETC(U)
AUG 81 E L WILSON, H H DOVEY, A HABIBULLAH
UNCLASSIFIED WES-IR-K-81-9 NL

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```
/25 FOOT WALL CONNECTING TO LEVELS 3 AND 5 AND DUMMY LEVEL 1

FRAME IDENTIFICATION NUMBER-----------------            1
NUMBER OF COLUMN LINES IN FRAME-------------            1
NUMBER OF STORY LEVELS IN FRAME-------------            3
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--            2
NUMBER OF BEAM PROPERTIES-------------------            0
NUMBER OF BEAM SPAN LOADING PATTERNS--------            0
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----            0
NUMBER OF PANEL ELEMENTS IN FRAME-----------            0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------            0
FRAME PEN PLOT FLAG-------------------------            0
STORY CONNECTIVITY CODE---------------------            1


STRUCTURE LEVELS CONNECTING TO FRAME
    5    3    1

COLUMN SECTION PROPERTY DATA

     ID       U         E          A          I         AV      W      T
 -   1      0.000  432000.0  .167E+02  .868E+03      13.89  25.00    .67
     2      0.000  432000.0  .100E+07  .100E+07       0.00   0.00   0.00


INPUT/GENERATED COLUMN LOCATIONS

LEVEL      1

LEV 5      1
LEV 3      1
LEV 1      2

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

     LEVEL/---------VERTICAL LOAD COND---------/
       ID          I         II        III        IV

     LEV 5      0.00      0.00      0.00      0.00
     LEV 3      0.00      0.00      0.00      0.00
     LEV 1      0.00      0.00      0.00      0.00

FRAME NO.=      1
TIME      =    .02
```



```
/25 FOOT WALL CONNECTING TO LEVELS 2 AND 4

FRAME IDENTIFICATION NUMBER-----------------            2
NUMBER OF COLUMN LINES IN FRAME-------------            1
NUMBER OF STORY LEVELS IN FRAME-------------            2
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--            1
NUMBER OF BEAM PROPERTIES-------------------            0
NUMBER OF BEAM SPAN LOADING PATTERNS--------            0
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----            0
NUMBER OF PANEL ELEMENTS IN FRAME-----------            0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------            0
FRAME PEN PLOT FLAG-------------------------            0
STORY CONNECTIVITY CODE---------------------            1


STRUCTURE LEVELS CONNECTING TO FRAME
    4    2

COLUMN SECTION PROPERTY DATA

     ID       U         E          A          I         AV      W      T
 -   1      0.000  432000.0  .167E+02  .868E+03      13.89  25.00    .67


INPUT/GENERATED COLUMN LOCATIONS

LEVEL      1

LEV 4      1
LEV 2      1

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

     LEVEL/---------VERTICAL LOAD COND---------/
       ID          I         II        III        IV

     LEV 4      0.00      0.00      0.00      0.00
     LEV 2      0.00      0.00      0.00      0.00

FRAME NO.=      2
TIME      =    .01
```

/TABS80 /SAMPLE EXAMPLE 6 PAGE 5
/DISCONTINUOUS FLOOR DIAPHRAGMS /SPECIAL STORY LEVEL CONNECTIVITY 04/09/81

/50 FOOT WALL CONNECTING TO LEVELS 2,3,4, AND 5

FRAME IDENTIFICATION NUMBER----------------	3
NUMBER OF COLUMN LINES IN FRAME------------	1
NUMBER OF STORY LEVELS IN FRAME------------	4
NUMBER OF COLUMN/PANEL/DIAGONAL PROPERTIES--	1
NUMBER OF BEAM PROPERTIES------------------	0
NUMBER OF BEAM SPAN LOADING PATTERNS--------	0
MAXIMUM POINT LOADS IN ANY SPAN LOADING-----	0
NUMBER OF PANEL ELEMENTS IN FRAME----------	0
NUMBER OF DIAGONAL ELEMENTS IN FRAME--------	0
FRAME PEN PLOT FLAG------------------------	0
STORY CONNECTIVITY CODE--------------------	1

STRUCTURE LEVELS CONNECTING TO FRAME
5 4 3 2

COLUMN SECTION PROPERTY DATA

ID	U	E	A	I	AV	W	T
1	0.000	432000.0	.333E+02	.694E+04	27.78	50.00	.67

INPUT/GENERATED COLUMN LOCATIONS

LEVEL	1
LEV 5	1
LEV 4	1
LEV 3	1
LEV 2	1

TOTAL VERTICAL LOAD APPLIED ON FRAME LEVEL-BY-LEVEL

LEVEL/ ID	---------VERTICAL LOAD COND---------/ I	II	III	IV
LEV 5	0.00	0.00	0.00	0.00
LEV 4	0.00	0.00	0.00	0.00
LEV 3	0.00	0.00	0.00	0.00
LEV 2	0.00	0.00	0.00	0.00

FRAME NO.= 3
TIME = .02

/TABS80 /SAMPLE EXAMPLE 6 PAGE 6
/DISCONTINUOUS FLOOR DIAPHRAGMS /SPECIAL STORY LEVEL CONNECTIVITY 04/09/81

FRAME LOCATION DATA

FRAME NO	FRAME TYPE	PRINT CODE	X1	Y1	X2	Y2	/--FRAME LOCATION--/
1	1	0	0.00	50.00	10.00	50.00	/LINE A (TYPE 1)
2	1	0	0.00	-50.00	10.00	-50.00	/LINE B (TYPE 1)
3	1	0	-60.00	0.00	-60.00	10.00	/LINE 1 (TYPE 1)
4	2	0	0.00	50.00	10.00	50.00	/LINE A (TYPE 2)
5	2	0	0.00	-50.00	10.00	-50.00	/LINE B (TYPE 2)
6	2	0	60.00	0.00	60.00	10.00	/LINE 3 (TYPE 2)
7	3	0	0.00	0.00	0.00	10.00	/LINE 2 (TYPE 3)

STATIC LOAD CONDITION DISPLACEMENTS

DISPLACEMENTS ARE AT THE CENTERS OF MASS OF THE RESPECTIVE LEVELS

LEVEL	DIRN	I	II	III	IV	A	B
LEV 5	X	0.00000	0.00000	0.00000	0.00000	.00240	0.00000
LEV 5	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.00220
LEV 5	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	.00000
LEV 4	X	0.00000	0.00000	0.00000	0.00000	.00240	0.00000
LEV 4	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.00185
LEV 4	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	-.00000
LEV 3	X	0.00000	0.00000	0.00000	0.00000	.00118	0.00000
LEV 3	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.00142
LEV 3	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	-.00000
LEV 2	X	0.00000	0.00000	0.00000	0.00000	.00118	0.00000
LEV 2	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.00093
LEV 2	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	-.00000
LEV 1	X	0.00000	0.00000	0.00000	0.00000	.00000	0.00000
LEV 1	Y	0.00000	0.00000	0.00000	0.00000	0.00000	.00000
LEV 1	ROTN	0.00000	0.00000	0.00000	0.00000	0.00000	-.00000

LOAD CASE DEFINITION DATA

NO	IC	I	II	III	IV	A	B	DYN-1	DYN-2	DYN-3	LOAD CASE ID
1	0	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	/SEISMIC-X
2	0	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	/SEISMIC-Y

FOR DYNAMICS BY THE RESPONSE SPECTRUM METHOD

DYNAMIC 1 . . . SRSS MODAL COMBINATION
DYNAMIC 2 . . . ABS MODAL COMBINATION
DYNAMIC 3 . . . CQC MODAL COMBINATION

FOR DYNAMICS BY THE TIME HISTORY METHOD

DYNAMIC 1 . . . NOT USED
DYNAMIC 2 . . . NOT USED
DYNAMIC 3 . . . TIME HISTORY MODAL ANALYSIS

/TABS80 /SAMPLE EXAMPLE 6 PAGE 35
/DISCONTINUOUS FLOOR DIAPHRAGMS /SPECIAL STORY LEVEL CONNECTIVITY 04/09/81

SUMMARY OF STORY SHEAR DISTRIBUTION
STORY-BY-STORY / FRAME-BY-FRAME

LEVEL ID	/--FRAME LOCATION--/	LOAD CONDITIONS I	II	III	IV	A	B
LEV 1							
	/LINE A (TYPE 1)	0.00	0.00	0.00	0.00	240.00	-27.23
	/LINE B (TYPE 1)	0.00	0.00	0.00	0.00	240.00	27.23
	/LINE 1 (TYPE 1)	0.00	0.00	0.00	0.00	0.00	285.38
	/LINE A (TYPE 2)	0.00	0.00	0.00	0.00	240.00	-16.70
	/LINE B (TYPE 2)	0.00	0.00	0.00	0.00	240.00	16.70
	/LINE 3 (TYPE 2)	0.00	0.00	0.00	0.00	0.00	212.16
	/LINE 2 (TYPE 3)	0.00	0.00	0.00	0.00	0.00	462.45
LEV 2							
	/LINE A (TYPE 1)	0.00	0.00	0.00	0.00	240.00	-27.23
	/LINE B (TYPE 1)	0.00	0.00	0.00	0.00	240.00	27.23
	/LINE 1 (TYPE 1)	0.00	0.00	0.00	0.00	0.00	285.38
	/LINE A (TYPE 2)	0.00	0.00	0.00	0.00	240.00	-16.70
	/LINE B (TYPE 2)	0.00	0.00	0.00	0.00	240.00	16.70
	/LINE 3 (TYPE 2)	0.00	0.00	0.00	0.00	0.00	212.16
	/LINE 2 (TYPE 3)	0.00	0.00	0.00	0.00	0.00	462.45
LEV 3							
	/LINE A (TYPE 1)	0.00	0.00	0.00	0.00	240.00	-27.23
	/LINE B (TYPE 1)	0.00	0.00	0.00	0.00	240.00	27.23
	/LINE 1 (TYPE 1)	0.00	0.00	0.00	0.00	0.00	285.38
	/LINE A (TYPE 2)	0.00	0.00	0.00	0.00	160.00	-14.64
	/LINE B (TYPE 2)	0.00	0.00	0.00	0.00	160.00	14.64
	/LINE 3 (TYPE 2)	0.00	0.00	0.00	0.00	0.00	135.60
	/LINE 2 (TYPE 3)	0.00	0.00	0.00	0.00	0.00	379.02
LEV 4							
	/LINE A (TYPE 1)	0.00	0.00	0.00	0.00	160.00	29.52
	/LINE B (TYPE 1)	0.00	0.00	0.00	0.00	160.00	-29.52
	/LINE 1 (TYPE 1)	0.00	0.00	0.00	0.00	0.00	110.81
	/LINE A (TYPE 2)	0.00	0.00	0.00	0.00	160.00	-14.64
	/LINE B (TYPE 2)	0.00	0.00	0.00	0.00	160.00	14.64
	/LINE 3 (TYPE 2)	0.00	0.00	0.00	0.00	0.00	135.60
	/LINE 2 (TYPE 3)	0.00	0.00	0.00	0.00	0.00	393.60
LEV 5							
	/LINE A (TYPE 1)	0.00	0.00	0.00	0.00	160.00	29.52
	/LINE B (TYPE 1)	0.00	0.00	0.00	0.00	160.00	-29.52
	/LINE 1 (TYPE 1)	0.00	0.00	0.00	0.00	0.00	110.81
	/LINE 2 (TYPE 3)	0.00	0.00	0.00	0.00	0.00	209.19

/TABS80 /SAMPLE EXAMPLE 6 PAGE 36
/DISCONTINUOUS FLOOR DIAPHRAGMS /SPECIAL STORY LEVEL CONNECTIVITY 04/09/81

TIME LOG (SECONDS)

FORM FRAME STIFFNESSES................	=	.08
SOLVE STATIC LOAD CASES...............	=	.02
MODE SHAPES AND FREQUENCIES...........	=	.03
COMPUTE FRAME DISPLACEMENTS...........	=	.00
MEMBER FORCES AND STRESSES............	=	.33
TOTAL TIME............................	=	.47

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APPENDIX A: CONTROL CARDS FOR USING CTABS80

Cynernet Scope 3.4, CDC Sunnyvale, California

1. The following set of control cards will create a tape from a card deck of the CTABS80 program. These control cards will store the program in absolute form on the tape. The program can be recalled from the tape and used when needed, as shown below.

```
TABS80,NT1.
USER,CSINTWC,ASHRAF.    )
                        )        User accounting information
PRØJECT,*USA*.          )
FTN,ØPT=2.
LØAD,LGØ.
NØGØ,TABS80.
REQUEST,TT,NT,SV,RING.
REWIND,TT,TABS80.
CØPYBF,TABS80,TT.
789  - Eor Card
Source deck of TABS 80
6789 - Eof Card
```

2. The following set of control cards will recall the program from the tape created above and execute it with data provided by the user.

```
TABS80,NT1.
USER,CSINTWC,ASHRAF.    )
                        )
PRØJECT,*USA*.          )        User accounting information
REQUEST,TT,NT,VSN=iiiiii.        iiiiii is a six character identification
                                 of the tape created in the run above
REWIND,TT,TABS80.
CØPYBF,TT,TABS80.
UNLØAD,TT.
REWIND,TABS80.
TABS80.
REWIND,TAPE9.
CØPY,TAPE9,ØUTPUT.
789  - Eor Card
TABS 80 Data
6789 - Eof Card
```

APPENDIX B: CARD IMAGE LISTING OF EXAMPLE PROBLEMS

```
$                                                                              TABS80   1       3    2
$------------------------------------------------------------------------      TABS80   2
$                          T A B S    8 0                                      TABS80   3  8.        15.       16.       15.
$                                                                              TABS80   4       4    2
$          L I S T I N G   O F   S A M P L E   P R O B L E M S                 TABS80   5
$------------------------------------------------------------------------      TABS80   6  8.         4.       16.        4.
$                                                                              TABS80   7       5    2
$      CARDS WITH A $-SIGN IN COLUMN 1 ARE COMMENT CARDS                       TABS80   8           26.
$      THESE CARDS ARE IGNORED BY THE PROGRAM                                  TABS80   9  20.       13.       28.       13.
$                                                                              TABS80  10       6    2
$                                                                              TABS80  11            4.
$      S A M P L E   P R O B L E M   1                                         TABS80  12  20.        2.       28.        2.
$                                                                              TABS80  13       7    2
/TABS80 /SAMPLE EXAMPLE 1                                                      TABS80  14           30.
/STATIC ANALYSIS /VERTICAL AND URC LATERAL                                     TABS80  15  20.       15.       28.       15.
    4    4    8    4    2    8    0    0    0    0    1    2    1             TABS80  16       8    2
12.       1000.                                                                TABS80  17            8.
    1     1 3.1056E-2                                                          TABS80  18  20.        4.       28.        4.
746.      0.        0.        48.       96.                                    TABS80  19       1    3
    2     1 3.1056E-2                                                          TABS80  20       2    3
839.      0.        0.        48.       96.                                    TABS80  21       1    3
ROOF      110.0                                                                TABS80  22       1    3
                                                                               TABS80  23       1    3
0.        0.        4.8       4.8                                              TABS80  24       1    3
0.        0.        4.8       4.8                                              TABS80  25       1    3
ST-3      210.0                                                                TABS80  26       1    2    0    0    0
                                                                               TABS80  27       3    4    0    0    2
0.        0.        4.8       4.8                                              TABS80  28       5    6    0    0    0
0.        0.        4.8       4.8                                              TABS80  29       7    8    0    0    2
ST-2      210.0                                                                TABS80  30       1    2    0    0    0
                                                                               TABS80  31       3    4    0    0    2
0.        0.        4.8       4.8                                              TABS80  32  /FRAME B
0.        0.        4.8       4.8                                              TABS80  33       2    5    4    1    1    4    2              2
ST-1      212.                                                                 TABS80  34  24.0      24.0      24.0      24.0
                                                                               TABS80  35  0.        0.        0.        0.
0.        0.        4.8       4.8                                              TABS80  36     -1 .15 432000.                                    1.33      1.33
0.        0.        4.8       4.8                                              TABS80  37     -1 .18 432000.                          1.5                 1.
/FRAMES A AND C                                                                TABS80  38       1    2
    1    4    4    2    1    8    2              2                             TABS80  39
16.0      36.0      24.0                                                       TABS80  40  8.        26.       16.       26.
0.        0.        0.                                                         TABS80  41       2    2
   -1 .15 432000.                                  1.33      1.33              TABS80  42
   -2 .15 432000.                                  25.33     1.                TABS80  43  8.         4.       16.        4.
   -1 .18 432000.                        1.5                 1.                TABS80  44       3    2
    1    2                                                                     TABS80  45
                                                                               TABS80  46  8.        30.       16.       30.
8.        13.       16.       13.                                              TABS80  47       4    2
    2    2                                                                     TABS80  48
                                                                               TABS80  49  8.         8.       16.        8.
8.        2.        16.       2.                                               TABS80  50       1    3
```

Cards 51–100 (second column of the listing) read:

```
TABS80  51
TABS80  52
TABS80  53
TABS80  54
TABS80  55
TABS80  56
TABS80  57
TABS80  58
TABS80  59
TABS80  60
TABS80  61
TABS80  62
TABS80  63
TABS80  64
TABS80  65
TABS80  66
TABS80  67
TABS80  68
TABS80  69
TABS80  70
TABS80  71
TABS80  72
TABS80  73
TABS80  74
TABS80  75
TABS80  76
TABS80  77
TABS80  78
TABS80  79
TABS80  80
TABS80  81
TABS80  82
TABS80  83
TABS80  84
TABS80  85
TABS80  86
TABS80  87
TABS80  88
TABS80  89
TABS80  90
TABS80  91
TABS80  92
TABS80  93
TABS80  94
TABS80  95
TABS80  96
TABS80  97
TABS80  98
TABS80  99
TABS80 100
```

```
TABS80 101    1   3
TABS80 102    1   3
TABS80 103    1   3
TABS80 104    1   3
TABS80 105    1   3
TABS80 106    1   2    0    0    0
TABS80 107    3   4    0    0    2
TABS80 108    1   2    0    0    0
TABS80 109    3   4    0    0    2
TABS80 110    1   0 -45.     -24.0     45.0      -24.0     FRAME A
TABS80 111    1     -45.      24.0     45.0       24.0     FRAME C
TABS80 112    2     -45.      0.0      45.0       0.0      FRAME B
TABS80 113    3     -48.0    -20.     -48.0       20.0     FRAME 1
TABS80 114    3      48.0    -20.      48.0       20.0     FRAME 5
TABS80 115    4     -24.0    -20.     -24.0       20.0     FRAME 2
TABS80 116    4      0.0     -20.      0.0        20.0     FRAME 3
TABS80 117    4   0 24.0     -20.      24.0       20.0     FRAME 4
TABS80 118
TABS80 119                    1.33
TABS80 120                    1.33
TABS80 121    1   0 1.                                             /DEAD LOAD
TABS80 122    2   0      1.                                        /LIVE LOAD
TABS80 123    3   0                      1.                        /X-SEISMIC
TABS80 124    4   0                            1.                  /Y-SEISMIC
TABS80 125 $
TABS80 126 $      S A M P L E   P R O B L E M   2
TABS80 127 $
TABS80 128 /TABS80 /SAMPLE EXAMPLE 2
TABS80 129 /A-FRAME AND ECCENTRICALLY BRACED FRAME /PIN BASED COLUMNS
TABS80 130     4    2    4    2    0    0    0    0    0    0    0    0    0
TABS80 131 1.         1.0
TABS80 132 ROOF       180.
TABS80 133
TABS80 134 30.
TABS80 135            30.
TABS80 136 ST-2       180.
TABS80 137
TABS80 138 20.
TABS80 139            20.
TABS80 140 ST-1       180.
TABS80 141
TABS80 142 20.
TABS80 143            20.
TABS80 144 DUMMY      30.            1.E10     1.E10     1.E10
TABS80 145
TABS80 146 0.
TABS80 147            0.
TABS80 148 /ECCENTRICALLY BRACED FRAME
TABS80 149     1    7    4    3    1    0    0    0    6    1
TABS80 150 48.        144.     48.      48.       144.      48.
```

```
    1   3                                                              TABS80 151
    1   3                                                              TABS80 152
    1   3                                                              TABS80 153
    1   3                                                              TABS80 154
    1   3                                                              TABS80 155
    1   3                                                              TABS80 156
    1   3                                                              TABS80 157
    1   3                                                              TABS80 158
    1   2    0    0    0                                               TABS80 159
    3   4    0    0    2                                               TABS80 160
    1   2    0    0    0                                               TABS80 161
    3   4    0    0    2                                               TABS80 162
    1   2    0    0    0                                               TABS80 163
    3   4    0    0    2                                               TABS80 164
    1   2    0    0    0                                               TABS80 165
    3   4    0    0    2                                               TABS80 166
/FRAMES 1 AND 5                                                        TABS80 167
    3   2    4    2    1    4    0    0         2                      TABS80 168
36.0                                                                   TABS80 169
0.0                                                                    TABS80 170
  -1 .15 432000.                                1.33       1.33        TABS80 171
  -2 .15 432000.                                29.33      1.          TABS80 172
  -1 .18 432000.                      1.5                  1.          TABS80 173
    1                                                                  TABS80 174
.55                                                                    TABS80 175
    2                                                                  TABS80 176
.08                                                                    TABS80 177
    3                                                                  TABS80 178
.63                                                                    TABS80 179
    4                                                                  TABS80 180
.16                                                                    TABS80 181
    1   3                                                              TABS80 182
    2   3                                                              TABS80 183
    1   3                                                              TABS80 184
    1   2    0    0    0                                               TABS80 185
    3   4    0    0    2                                               TABS80 186
/FRAMES 2, 3 AND 4                                                     TABS80 187
    4   3    4    1    1    4    0              2                      TABS80 188
24.0      24.0                                                         TABS80 189
0.0       0.0                                                          TABS80 190
  -1 .15 432000.                                1.33       1.33        TABS80 191
  -1 .18 432000.                      1.5                  1.          TABS80 192
    1                                                                  TABS80 193
1.1                                                                    TABS80 194
    2                                                                  TABS80 195
.16                                                                    TABS80 196
    3                                                                  TABS80 197
1.25                                                                   TABS80 198
    4                                                                  TABS80 199
.32                                                                    TABS80 200
```

```
0.                                                                TABS80 201
    1     29500.   999999.                                        TABS80 202
    2     29500.   9.71      171.0     2.82      9.98             TABS80 203
    3     29500.   32.       1240.     7.52      14.32            TABS80 204
    1     29500.   1480.     4.    .5  21.13     0.        9.09   TABS80 205
    3    2                                                        TABS80 206
    1                                                             TABS80 207
    0    2                                                        TABS80 208
    1                                                             TABS80 209
    C    2                                                        TABS80 210
    1                                                             TABS80 211
    3    2                                                        TABS80 212
    1                                                             TABS80 213
    0    2                                                        TABS80 214
    1                                                             TABS80 215
    0    2                                                        TABS80 216
    1                                                             TABS80 217
    3    2                                                        TABS80 218
    1                                                             TABS80 219
    1    2                                                        TABS80 220
    C                                                             TABS80 221
    1    2                                                        TABS80 222
    0                                                             TABS80 223
    1    2                                                        TABS80 224
    C                                                             TABS80 225
    1    2                                                        TABS80 226
    0                                                             TABS80 227
    1    2                                                        TABS80 228
    C                                                             TABS80 229
    1    2                                                        TABS80 230
    C                                                             TABS80 231
    4    2    3    2    2                                         TABS80 232
    4    5    6    2    2                                         TABS80 233
/A-FRAME                                                          TABS80 234
    2    9    4    3    1    0    0    0   10    1               TABS80 235
60.      60.       60.       180.      180.      60.       60.    TABS80 236
60.                                                               TABS80 237
0.                                                                TABS80 238
0.                                                                TABS80 239
    1     29500.   999999.                                        TABS80 240
    2     29500.   9.71      171.0     2.82      9.98             TABS80 241
    3     29500.   32.       1240.     7.52      14.32            TABS80 242
    1     29500.   1480.     4.    .5  21.13     0.        9.09   TABS80 243
    C    2                                                        TABS80 244
    1                                                             TABS80 245
    0    3                                                        TABS80 246
    C    3                                                        TABS80 247
    C    3                                                        TABS80 248
    3    2                                                        TABS80 249
    1                                                             TABS80 250
```

```
    0    3                                                        TABS80 251
    C    3                                                        TABS80 252
    0    3                                                        TABS80 253
    C    2                                                        TABS80 254
    1                                                             TABS80 255
    0    3                                                        TABS80 256
    0    1                                                        TABS80 257
    1                                                             TABS80 258
    C                                                             TABS80 259
    C                                                             TABS80 260
    1    1                                                        TABS80 261
    C                                                             TABS80 262
    1    2                                                        TABS80 263
    0                                                             TABS80 264
    1    2                                                        TABS80 265
    C                                                             TABS80 266
    0                                                             TABS80 267
    1    1                                                        TABS80 268
    C                                                             TABS80 269
    C    1                                                        TABS80 270
    1                                                             TABS80 271
    0                                                             TABS80 272
    C    3                                                        TABS80 273
    2    1    4    2                                              TABS80 274
    2    5    4    2                                              TABS80 275
    2    5    6    2                                              TABS80 276
    2    9    6    2                                              TABS80 277
    2    1    2    2                                              TABS80 278
    3    2    3    2                                              TABS80 279
    4    3    4    2                                              TABS80 280
    2    9    8    2                                              TABS80 281
    3    8    7    2                                              TABS80 282
    4    7    6    2                                              TABS80 283
    1    1 -120.    -240.     -120.     240.     /E-FRAME AT LINE 1   TABS80 284
    1    0  120.    -240.      120.     240.     /E-FRAME AT LINE 2   TABS80 285
    2    1 -360.    -300.      360.    -300.     /A-FRAME AT LINE A   TABS80 286
    2    0 -360.     300.      360.     300.     /A-FRAME AT LINE B   TABS80 287
    1    0                     1.                        /WIND-X      TABS80 288
    2    0                               1.              /WIND-Y      TABS80 289
$                                                                 TABS80 290
$     S A M P L E   P R O B L E M   3                             TABS80 291
$                                                                 TABS80 292
/TABS80 /SAMPLE EXAMPLE 3                                         TABS80 293
/COMPLEX SHEAR WALL MODELING /SHEAR PANEL USAGE                   TABS80 294
    3    3    3    2    2    9    0    0    0    0    1    1    0 TABS80 295
12.      1000.                                                    TABS80 296
    1    1 .031056                                                TABS80 297
260.     0.        0.        36.       36.                        TABS80 298
ROOF     1 12.                                                    TABS80 299
                                                                  TABS80 300
```

```
ST-2      1 12.

ST-1      1 12.

/PIER SPANDREL SYSTEM
    1    4    3    3    2    0    0    0    0    2
11.      10.       11.5
0.       3.        3.
   -1    432000.                                  6.        .67
   -2    432000.                                  4.        .67
   -3    432000.                                  5.        .67
   -1    432000.                        3.        0.        .67
   -2    432000.                        3.        3.
    1    2
    2    2
    2
    C    1
    3    2
    1
    2    1
    1
    2    1
    1    1
    2
/DISCONTINUOUS SHEAR WALL
    2    4    3    3    2    0    0    3    0    2
12.      12.       12.
0.       0.        0.
   -1    432000.                                  2.        2.
   -2    432000.                                  24.       .67
   -3    432000.                                  36.       .67
   -1    432000.                        2.        0.        1.
    2    432000.   999999.
    1
    0    1
    C    2
    C    2
    0    1
    1
    1
    2    1
    2    2
    2    2
    1    1    2    2
```

```
                                                                                                 TABS80  351
TABS80  301        2    1    3    3                                                              TABS80  352
TABS80  302        3    2    3    2                                                              TABS80  353
TABS80  303  /WALL WITH ARBITRARY OPENINGS                                                       TABS80  354
TABS80  304        3    6    3    5    3    0    0    3    C    2                                TABS80  355
TABS80  305  7.5        6.0       3.0       6.0       10.5                                       TABS80  356
TABS80  306  0.0        0.0       0.0       0.0       3.0                                        TABS80  357
TABS80  307        1     432000.0      2.0       1.5       1.67      3.0                         TABS80  358
TABS80  308        2     432000.0      4.0       12.0      3.33      6.0                         TABS80  359
TABS80  309        3     432000.0      12.0      325.6     10.0      -                           TABS80  360
TABS80  310        4     432000.0      18.0      1099.0    15.0      -                           TABS80  361
TABS80  311        5     432000.0      10.0      186.4     8.33      -                           TABS80  362
TABS80  312        1     432000.0 999999.   4.0  0.5  3.0                                        TABS80  363
TABS80  313        2     432000.0 1.5       4.0  0.5  3.          0.          1.67               TABS80  364
TABS80  314        3     432000.0 999999.                                                        TABS80  365
TABS80  315        0                                                                             TABS80  366
TABS80  316        1                                                                             TABS80  367
TABS80  317        C                                                                             TABS80  368
TABS80  318        0    2                                                                        TABS80  369
TABS80  319        0    2                                                                        TABS80  370
TABS80  320        0    2                                                                        TABS80  371
TABS80  321        C    1                                                                        TABS80  372
TABS80  322        2                                                                             TABS80  373
TABS80  323        1                                                                             TABS80  374
TABS80  324        0                                                                             TABS80  375
TABS80  325        1                                                                             TABS80  376
TABS80  326        3                                                                             TABS80  377
TABS80  327        1                                                                             TABS80  378
TABS80  328        3                                                                             TABS80  379
TABS80  329        3    2                                                                        TABS80  380
TABS80  330        3    1                                                                        TABS80  381
TABS80  331        1                                                                             TABS80  382
TABS80  332        2                                                                             TABS80  383
TABS80  333        3                                                                             TABS80  384
TABS80  334        3                                                                             TABS80  385
TABS80  335        2                                                                             TABS80  386
TABS80  336        3                                                                             TABS80  387
TABS80  337        1                                                                             TABS80  388
TABS80  338        3    1    3    3                                                              TABS80  389
TABS80  339        2    2    5    4                                                              TABS80  390
TABS80  340        1    1    2    5                                                              TABS80  391
TABS80  341        1    0 -18.     0.        -18.      10.       /PIER-SPANDREL                  TABS80  392
TABS80  342        2    0 0.       18.       10.       18.       /DISCONTINUOUS WALL             TABS80  393
TABS80  343        3    0 18.      0.        18.       10.       /ARBITRARY OPENINGS             TABS80  394
TABS80  344                                                                                      TABS80  395
TABS80  345                        1.33                                                          TABS80  396
TABS80  346                        1.33                                                          TABS80  397
TABS80  347        1    0                    1.                            /SEISMIC-X            TABS80  398
TABS80  348        2    0                              1.                  /SEISMIC-Y            TABS80  399
TABS80  349  $                                                                                   TABS80  400
TABS80  350  $     S A M P L E   P R O B L E M   4 A
```

```
                                                                                 TABS80 401     .0270     .3297                                     TABS80 451
/TABS80 /SAMPLE EXAMPLE 4A                                                       TABS80 402     .0278     .3429                                     TABS80 452
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /SPECTRUM                    TABS80 403     .0286     .3544                                     TABS80 453
    3    1    4    3    3    2    0    0    0    0    0    1    2              TABS80 404     .0294     .3626                                     TABS80 454
                                                                                 TABS80 405     .0303     .3683                                     TABS80 455
    1    2 2.500 E-3                                                             TABS80 406     .0313     .3676                                     TABS80 456
120.      240.      480.      480.      960.                                     TABS80 407     .0323     .3629                                     TABS80 457
160.      720.      240.      480.      480.                                     TABS80 408     .0333     .3604                                     TABS80 458
T-3      1 144.                                                                  TABS80 409     .0345     .3637                                     TABS80 459
                                                                                 TABS80 410     .0357     .3632                                     TABS80 460
                                                                                 TABS80 411     .0370     .3610                                     TABS80 461
                                                                                 TABS80 412     .0385     .3585                                     TABS80 462
.T-2     1 144.                                                                  TABS80 413     .0400     .3551                                     TABS80 463
                                                                                 TABS80 414     .0417     .3458                                     TABS80 464
                                                                                 TABS80 415     .0435     .3436                                     TABS80 465
                                                                                 TABS80 416     .0455     .3465                                     TABS80 466
T-1      1 144.                                                                  TABS80 417     .0476     .3528                                     TABS80 467
                                                                                 TABS80 418     .0500     .3542                                     TABS80 468
                                                                                 TABS80 419     .0526     .3544                                     TABS80 469
                                                                                 TABS80 420     .0556     .3546                                     TABS80 470
/TYPICAL BRACED FRAME                                                            TABS80 421     .0588     .3917                                     TABS80 471
    1    3    3    1    1    0         0   12    1                               TABS80 422     .0625     .4305                                     TABS80 472
/40.C     240.0                                                                  TABS80 423     .0667     .4455                                     TABS80 473
.0        0.0                                                                    TABS80 424     .0714     .4784                                     TABS80 474
    1      29500.0      6.0                                                      TABS80 425     .0769     .5053                                     TABS80 475
    1                                                                            TABS80 426     .0833     .5181                                     TABS80 476
    1    2                                                                       TABS80 427     .0909     .4776                                     TABS80 477
    1    2                                                                       TABS80 428     .0966     .5526                                     TABS80 478
    1    2                                                                       TABS80 429     .1000     .5816                                     TABS80 479
    C    2                                                                       TABS80 430     .1015     .5846                                     TABS80 480
    C    2                                                                       TABS80 431     .1070     .5548                                     TABS80 481
    3    2    1    1                                                             TABS80 432     .1130     .5292                                     TABS80 482
    3    1    2    1                                                             TABS80 433     .1198     .5952                                     TABS80 483
    3    3    2    1                                                             TABS80 434     .1274     .6373                                     TABS80 484
    3    2    3    1                                                             TABS80 435     .1361     .6615                                     TABS80 485
    2    2    1    1                                                             TABS80 436     .1460     .6885                                     TABS80 486
    2    1    2    1                                                             TABS80 437     .1575     .8712                                     TABS80 487
    2    3    2    1                                                             TABS80 438     .1709     .8167                                     TABS80 488
    2    2    3    1                                                             TABS80 439     .1869     .9879                                     TABS80 489
    1    2    1    1                                                             TABS80 440     .2062     .9697                                     TABS80 490
    1    1    2    1                                                             TABS80 441     .2299     .7006                                     TABS80 491
    1    3    2    1                                                             TABS80 442     .2597     .8576                                     TABS80 492
    1    2    3    1                                                             TABS80 443     .2985     .7385                                     TABS80 493
    1    0 0.0      0.0       10.0      0.0       FRAME X1                       TABS80 444     .3509     .8705                                     TABS80 494
    1    1 0.0      960.0     10.0      960.0     FRAME X2                       TABS80 445     .4255     .9090                                     TABS80 495
    1    0 0.0      0.0       0.0       10.0      FRAME Y1                       TABS80 446     .5405     .9824                                     TABS80 496
    1    1 960.0    0.0       960.0     10.0      FRAME Y2                       TABS80 447     .7407     .4761                                     TABS80 497
   51    2 386.4    90.0      .05       EL CENTRO EARTHQUAKE                     TABS80 448    1.1765     .2713                                     TABS80 498
        .0       .3275                                                           TABS80 449    2.0571     .1983                                     TABS80 499
     .0263       .3299                                                           TABS80 450    1    0                        1.            /SRSS    TABS80 500
```

```
    2    0                              1.                   /ABS     TABS80  501
    3    0                                        1.         /COC     TABS80  502
'                                                                     TABS80  503
'     S A M P L E   P R O B L E M   4 B                               TABS80  504
'                                                                     TABS80  505
/TABS80 /SAMPLE EXAMPLE 4B                                            TABS80  506
/BRACED FRAME STRUCTURE /THREE DIMENSIONAL DYNAMICS /HISTORY          TABS80  507
    3    1    4    1    4    2    0    0    0    0    0    1          TABS80  508
                                                                      TABS80  509
    1    2 2.588 E-3                                                  TABS80  510
120.      240.      480.      480.      960.                          TABS80  511
160.      720.      240.      480.      480.                          TABS80  512
ST-3     1 144.                                                       TABS80  513
                                                                      TABS80  514
                                                                      TABS80  515
                                                                      TABS80  516
ST-2     1 144.                                                       TABS80  517
                                                                      TABS80  518
                                                                      TABS80  519
                                                                      TABS80  520
ST-1     1 144.                                                       TABS80  521
                                                                      TABS80  522
                                                                      TABS80  523
                                                                      TABS80  524
/TYPICAL BRACED FRAME                                                 TABS80  525
    1    3    3    1    1    0         0   12    1                    TABS80  526
240.C     240.0                                                       TABS80  527
0.0       0.0                                                         TABS80  528
    1      29500.0       6.0                                          TABS80  529
    1                                                                 TABS80  530
    1    2                                                            TABS80  531
    1    2                                                            TABS80  532
    1    2                                                            TABS80  533
    0    2                                                            TABS80  534
    C    2                                                            TABS80  535
    3    2    1    1                                                  TABS80  536
    3    1    2    1                                                  TABS80  537
    3    3    2    1                                                  TABS80  538
    3    2    3    1                                                  TABS80  539
    2    2    1    1                                                  TABS80  540
    2    1    2    1                                                  TABS80  541
    2    3    2    1                                                  TABS80  542
    2    2    3    1                                                  TABS80  543
    1    2    1    1                                                  TABS80  544
    1    1    2    1                                                  TABS80  545
    1    3    2    1                                                  TABS80  546
    1    2    3    1                                                  TABS80  547
    1    0 0.0      0.0       10.0      0.0       FRAME X1            TABS80  548
    1    1 0.0      960.0     10.0      960.0     FRAME X2            TABS80  549
    1    0 0.0      0.0       0.0       10.0      FRAME Y1            TABS80  550
```

```
    1    1 960.0    0.0       960.0     10.0      FRAME Y2            TABS80  551
/ELCENTRO EARTHQUAKE (12 SECS)  (6F10.0)                              TABS80  552
  222  300 386.4    90.       .04                                     TABS80  553
    1 .05                                                             TABS80  554
    2 .05                                                             TABS80  555
  0.C0000    .01080    .04200    .00100    .09700    .01590           TABS80  556
   .16100   -.00010    .22100    .01890    .26300    .00010           TABS80  557
   .29100    .00590    .33200   -.00120    .37400    .02000           TABS80  558
   .42900   -.02370    .47100    .00760    .58100    .04250           TABS80  559
   .62300    .00940    .66500    .01380    .72000   -.00880           TABS80  560
   .72010   -.02560    .78900   -.03870    .78910   -.05680           TABS80  561
   .87200   -.02320    .87210   -.03430    .94100   -.04020           TABS80  562
   .94110   -.06030    .99700   -.07890   1.06600   -.06660           TABS80  563
  1.06610   -.03810   1.09400   -.04290   1.16800    .08970           TABS80  564
  1.31500   -.16960   1.38400   -.08280   1.41200   -.00290           TABS80  565
  1.44000   -.09450   1.48100   -.08850   1.50900   -.10800           TABS80  566
  1.537G0   -.12800   1.62800    .11440   1.70300    .23550           TABS80  567
  1.80000    .14280   1.85500    .17770   1.92400   -.26100           TABS80  568
  2.00700   -.31940   2.21500    .29520   2.27000    .26340           TABS80  569
  2.32000   -.29840   2.39500    .00540   2.45000    .28650           TABS80  570
  2.51900   -.04690   2.57500    .15160   2.65200    .20770           TABS80  571
  2.70800    .10870   2.76900   -.03250   2.89300    .10330           TABS80  572
  2.97600   -.08030   3.06800    .05200   3.12900   -.15470           TABS80  573
  3.21200    .00650   3.25300   -.20600   3.38600    .19270           TABS80  574
  3.41900   -.09370   3.53000    .17080   3.59900   -.03590           TABS80  575
  3.66800    .03650   3.73800   -.07360   3.83500    .03110           TABS80  576
  3.90400   -.18330   4.01400    .02270   4.05600   -.04350           TABS80  577
  4.10600    .02160   4.22200   -.19720   4.31400   -.17620           TABS80  578
  4.41600    .14600   4.47100   -.00470   4.61800    .25720           TABS80  579
  4.66500   -.20450   4.75600    .06080   4.83100   -.27330           TABS80  580
  4.97000    .17790   5.03900    .03010   5.10800    .21630           TABS80  581
  5.19900    .02670   5.23300    .12520   5.30200    .12900           TABS80  582
  5.33000    .10890   5.34300   -.02390   5.45400    .17230           TABS80  583
  5.51000   -.10210   5.60600    .01410   5.69000   -.19490           TABS80  584
  5.77300   -.02420   5.80000   -.00500   5.80900   -.02750           TABS80  585
  5.86900   -.05730   5.88300   -.03270   5.92500    .02160           TABS80  586
  5.98000    .01080   6.01300    .02350   6.08500   -.06650           TABS80  587
  6.13200    .00140   6.17400    .04930   6.18800    .01490           TABS80  588
  6.18810   -.02000   6.22900   -.03810   6.27900    .02070           TABS80  589
  6.32600   -.00580   6.36800   -.06030   6.38200   -.01620           TABS80  590
  6.40900    .02000   6.45900   -.01760   6.47800   -.00330           TABS80  591
  6.52000    .00430   6.53400   -.00400   6.56200   -.00990           TABS80  592
  6.57500   -.00170   6.60300   -.01700   6.64500    .03730           TABS80  593
  6.68600    .04570   6.71400    .03850   6.72800    .00090           TABS80  594
  6.76900   -.02880   6.76910    .00160   6.81100    .01130           TABS80  595
  6.85200    .00220   6.90800    .00920   6.99100   -.09960           TABS80  596
  7.C7400    .03600   7.12100    .00780   7.14300   -.02770           TABS80  597
  7.14900    .00260   7.17100    .02720   7.22600    .05760           TABS80  598
  7.29500   -.04920   7.37000    .02970   7.40600    .01090           TABS80  599
  7.42500    .01860   7.46100   -.02530   7.52500   -.03470           TABS80  600
```

```
 7.57200    .00360   7.60000   -.06200   7.64100   -.02800         TABS80  601
 7.66900   -.01960   7.69100    .00680   7.75200   -.00540         TABS80  602
 7.79400   -.06030   7.83500   -.03570   7.87700   -.07160         TABS80  603
 7.96000   -.01400   7.98700   -.00560   8.00100    .02220         TABS80  604
 8.07000    .04680   8.12600    .02600   8.12610   -.03350         TABS80  605
 8.19500   -.01280   8.22300    .06610   8.27800    .03050         TABS80  606
 8.33400    .02460   8.40300    .03470   8.45800   -.03690         TABS80  607
 8.53300   -.03440   8.59600   -.01040   8.63800   -.02600         TABS80  608
 8.73500    .15340   8.81800   -.00280   8.86000    .02330         TABS80  609
 8.88200   -.02610   8.91500   -.00220   8.95600   -.10490         TABS80  610
 9.05300    .12600   9.09500    .03200   9.12300    .09550         TABS80  611
 9.15000    .12460   9.25300   -.03200   9.28900   -.04510         TABS80  612
 9.42700    .13010   9.44100   -.16570   9.51000    .04190         TABS80  613
 9.63500   -.09360   9.70400    .08160   9.81500   -.08810         TABS80  614
 9.89800    .00640   9.93900   -.00060   9.99500    .05860         TABS80  615
10.02200   -.07130  10.05000   -.04480  10.05010   -.02210         TABS80  616
10.10500    .00930  10.10510    .00240  10.18800    .05100         TABS80  617
10.27200   -.12430  10.38200    .05870  10.42400    .01330         TABS80  618
10.45200    .03860  10.46500    .11640  10.50700   -.03740         TABS80  619
10.53400   -.05720  10.64500    .03080  10.70100    .02230         TABS80  620
10.71400    .05150  10.77000    .09030  10.83900   -.01940         TABS80  621
10.92200    .04710  10.92210   -.06770  10.96400   -.07940         TABS80  622
10.99100   -.01200  11.07400    .06060  11.08800   -.02690         TABS80  623
11.11600   -.04160  11.20700    .02930  11.20710    .05520         TABS80  624
11.22700    .07560  11.26000    .04310  11.32400    .02080         TABS80  625
11.43400    .11800  11.57300   -.09990  11.65600   -.12470         TABS80  626
11.72500   -.20940  11.72510   -.14180  11.78000   -.11630         TABS80  627
11.80000   0.00000  11.87700    .07620  11.91900    .05700         TABS80  628
11.98000    .13540  12.04300    .06730  12.11300    .08650         TABS80  629
    1    0                                  1.        /HISTORY      TABS80  630
$                                                                   TABS80  631
$     S A M P L E   P R O B L E M   5 A                             TABS80  632
$                                                                   TABS80  633
/TABS80 /SAMPLE EXAMPLE 5A                                          TABS80  634
/TWO DIMENSIONAL DYNAMICS /RESPONSE SPECTRUM ANALYSIS               TABS80  635
    0    1    1    3    3    8    1    0    0    0    0    0    0   TABS80  636
                                                                    TABS80  637
ROOF       156.0                                                    TABS80  638
.473                                                                TABS80  639
                                                                    TABS80  640
                                                                    TABS80  641
LVL-6      156.0                                                    TABS80  642
.487                                                                TABS80  643
                                                                    TABS80  644
                                                                    TABS80  645
LVL-5      156.0                                                    TABS80  646
.487                                                                TABS80  647
                                                                    TABS80  648
                                                                    TABS80  649
LVL-4      156.0                                                    TABS80  650
```

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.487                                                                TABS80  651
                                                                    TABS80  652
                                                                    TABS80  653
LVL-3      156.0                                                    TABS80  654
.487                                                                TABS80  655
                                                                    TABS80  656
                                                                    TABS80  657
LVL-2      162.0                                                    TABS80  658
.487                                                                TABS80  659
                                                                    TABS80  660
                                                                    TABS80  661
LVL-1      156.0                                                    TABS80  662
.515                                                                TABS80  663
                                                                    TABS80  664
                                                                    TABS80  665
PILES      60.0                                                     TABS80  666
1.25                                                                TABS80  667
                                                                    TABS80  668
                                                                    TABS80  669
/2-D FRAME                                                          TABS80  670
    1    3    8    5    4    0                   1                  TABS80  671
360.0      360.0                                                    TABS80  672
0.0        0.0                                                      TABS80  673
    1      29000.0      51.17     2150.0    12.5      14.0          TABS80  674
    2      29000.0      62.10     2670.0    15.4      14.0          TABS80  675
    3      29000.0      72.30     3230.0    18.3      14.0          TABS80  676
    4      29000.0      84.40     3910.0    22.0      14.0          TABS80  677
    5      29000.0      6000.999999.        20.0      14.0          TABS80  678
    1      29000.0  3330.             24.                           TABS80  679
    2      29000.0  4020.             24.                           TABS80  680
    3      29000.0  5120.             24.                           TABS80  681
    4      29000.0  22000.                                          TABS80  682
    1    1                                                          TABS80  683
    2    1                                                          TABS80  684
    3    2                                                          TABS80  685
    5    0                                                          TABS80  686
    2    1                                                          TABS80  687
    3    1                                                          TABS80  688
    4    2                                                          TABS80  689
    5    0                                                          TABS80  690
    1    1                                                          TABS80  691
    2    1                                                          TABS80  692
    3    2                                                          TABS80  693
    5    0                                                          TABS80  694
    1    2                                                          TABS80  695
    2    1                                                          TABS80  696
    3    1                                                          TABS80  697
    4    0                                                          TABS80  698
    1    2                                                          TABS80  699
    2    1                                                          TABS80  700
```

```
  3   1                                                              TABS80  701
  4   0                                                              TABS80  702
  1   0 0.        0.          10.0        0.        /FRAME OF EXAMPLE 5A TABS80  703
 51   0 386.4     90.0        .05         /ELCENTRO EARTHQUAKE           TABS80  704
       .0       .3275                                                TABS80  705
    .0263       .3299                                                TABS80  706
    .0270       .3297                                                TABS80  707
    .0278       .3429                                                TABS80  708
    .0286       .3544                                                TABS80  709
    .0294       .3626                                                TABS80  710
    .0303       .3683                                                TABS80  711
    .0313       .3676                                                TABS80  712
    .0323       .3629                                                TABS80  713
    .0333       .3604                                                TABS80  714
    .0345       .3637                                                TABS80  715
    .0357       .3632                                                TABS80  716
    .0370       .3610                                                TABS80  717
    .0385       .3585                                                TABS80  718
    .0400       .3551                                                TABS80  719
    .0417       .3458                                                TABS80  720
    .0435       .3436                                                TABS80  721
    .0455       .3465                                                TABS80  722
    .0476       .3528                                                TABS80  723
    .0500       .3542                                                TABS80  724
    .0526       .3544                                                TABS80  725
    .0556       .3546                                                TABS80  726
    .0588       .3917                                                TABS80  727
    .0625       .4305                                                TABS80  728
    .0667       .4455                                                TABS80  729
    .0714       .4784                                                TABS80  730
    .0769       .5053                                                TABS80  731
    .0833       .5181                                                TABS80  732
    .0909       .4776                                                TABS80  733
    .0966       .5526                                                TABS80  734
    .1000       .5816                                                TABS80  735
    .1015       .5846                                                TABS80  736
    .1070       .5548                                                TABS80  737
    .1130       .5292                                                TABS80  738
    .1190       .5952                                                TABS80  739
    .1274       .6373                                                TABS80  740
    .1361       .6615                                                TABS80  741
    .1460       .6885                                                TABS80  742
    .1575       .8712                                                TABS80  743
    .1709       .8167                                                TABS80  744
    .1869       .9879                                                TABS80  745
    .2062       .9697                                                TABS80  746
    .2299       .7006                                                TABS80  747
    .2597       .8576                                                TABS80  748
    .2985       .7385                                                TABS80  749
    .3509       .8705                                                TABS80  750

       .4255       .9090                                             TABS80  751
       .5405       .9824                                             TABS80  752
       .7407       .4761                                             TABS80  753
      1.1765       .2713                                             TABS80  754
      2.8571       .1983                                             TABS80  755
       1                                   1.                  /SRSS TABS80  756
       2                                        1.              /ABS TABS80  757
       3                                             1.         /CQC TABS80  758
$                                                                    TABS80  759
$     S A M P L E   P R O B L E M   5 B                              TABS80  760
$                                                                    TABS80  761
/TABS80 /SAMPLE EXAMPLE 5B                                           TABS90  762
/TWO DIMENSIONAL DYNAMICS /TIME HISTORY ANALYSIS                     TABS80  763
       8    1    1    1    4    8    1                               TABS80  764
                                                                     TABS80  765
ROOF        156.0                                                    TABS80  766
.473                                                                 TABS80  767
                                                                     TABS80  768
                                                                     TABS80  769
LVL-6       156.0                                                    TABS80  770
.487                                                                 TABS80  771
                                                                     TABS80  772
                                                                     TABS80  773
LVL-5       156.0                                                    TABS80  774
.487                                                                 TABS80  775
                                                                     TABS80  776
                                                                     TABS80  777
LVL-4       156.0                                                    TABS80  778
.487                                                                 TABS80  779
                                                                     TABS80  780
                                                                     TABS80  781
LVL-3       156.0                                                    TABS80  782
.487                                                                 TABS80  783
                                                                     TABS80  784
                                                                     TABS80  785
LVL-2       162.0                                                    TABS80  786
.487                                                                 TABS80  787
                                                                     TABS80  788
                                                                     TABS80  789
LVL-1       156.0                                                    TABS80  790
.515                                                                 TABS80  791
                                                                     TABS80  792
                                                                     TABS80  793
PILES       60.0                                                     TABS80  794
1.25                                                                 TABS80  795
                                                                     TABS80  796
                                                                     TABS80  797
/2-D FRAME                                                           TABS80  798
     1    3    8    5    4    0                                      TABS80  799
360.0       360.0                                                    TABS80  800
```

```
0.0       0.0                                                        TABS80 801
     1     29000.0      51.17     2150.0     12.5      14.0          TABS80 802
     2     29000.0      62.10     2670.0     15.4      14.0          TABS80 803
     3     29000.0      72.30     3230.0     18.3      14.0          TABS80 804
     4    29000.0      84.40     3910.0    22.0      14.0            TABS80 805
     5     29000.0      6000.999999.         20.0      14.0          TABS80 806
     1     29000.0 3330.              24.                            TABS80 807
     2     29000.0 4020.              24.                            TABS80 808
     3     29000.0 5120.              24.                            TABS80 809
     4     29000.0 22000.                                            TABS80 810
     1    1                                                          TABS80 811
     2    1                                                          TABS80 812
     3    2                                                          TABS80 813
     5    0                                                          TABS80 814
     2    1                                                          TABS80 815
     3    1                                                          TABS80 816
     4    2                                                          TABS80 817
     5    0                                                          TABS80 818
     1    1                                                          TABS80 819
     2    1                                                          TABS80 820
     3    2                                                          TABS80 821
     5    0                                                          TABS80 822
     1    2                                                          TABS80 823
     2    1                                                          TABS80 824
     3    1                                                          TABS80 825
     4    0                                                          TABS80 826
     1    2                                                          TABS80 827
     2    1                                                          TABS80 828
     3    1                                                          TABS80 829
     4    0                                                          TABS80 830
     1    0 0.        0.        10.0      0.        /FRAME OF EXAMPLE 58 TABS80 831
/ELCENTRO EARTHQUAKE (12 SECS)  (6F10.0)                             TABS80 832
  222  150 386.4     90.       .08                                   TABS80 833
     1 .05                                                           TABS80 834
     2 .05                                                           TABS80 835
     3 .05                                                           TABS80 836
     4 .05                                                           TABS80 837
     5 .05                                                           TABS80 838
     6 .05                                                           TABS80 839
     7 .05                                                           TABS80 840
     8 .05                                                           TABS80 841
   0.00000    .01080    .04200    .00100    .09700    .01590         TABS80 842
    .16100   -.00010    .22100    .01890    .26300    .00010         TABS80 843
    .29100    .06590    .33200   -.00120    .37400    .02000         TABS80 844
    .42900   -.02370    .47100    .00760    .58100    .04250         TABS80 845
    .62300    .00940    .66500    .01380    .72000   -.00880         TABS80 846
    .72010   -.02560    .78900   -.03870    .78910   -.05680         TABS80 847
    .87200   -.02320    .87210   -.03430    .94100   -.04020         TABS80 848
    .94110   -.06030    .99700   -.07890   1.06600   -.06660         TABS80 849
   1.06410   -.03810   1.09400   -.04290   1.16800    .08970         TABS80 850
```

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   1.31500   -.16960   1.38400   -.08280   1.41200   -.08290         TABS80 851
   1.44000   -.09450   1.48100   -.08850   1.50900   -.10600         TABS80 852
   1.53700   -.12800   1.62800    .11440   1.70300    .23550         TABS80 853
   1.80000    .14280   1.85500    .17770   1.92400   -.26100         TABS80 854
   2.00700   -.31940   2.21500    .29520   2.27000    .26340         TABS80 855
   2.32000   -.29840   2.39500    .00540   2.45000    .28650         TABS80 856
   2.51900   -.04690   2.57500    .15160   2.65200    .20770         TABS80 857
   2.70800    .10870   2.76900   -.03250   2.89300    .10330         TABS80 858
   2.97600   -.08030   3.06800    .05200   3.12900   -.15470         TABS80 859
   3.21200    .00650   3.25300   -.20600   3.38600    .19270         TABS80 860
   3.41900   -.09370   3.53000    .17080   3.59900   -.03590         TABS80 861
   3.66800    .03650   3.73800   -.07360   3.83500    .03110         TABS80 862
   3.90400   -.18330   4.01400    .02270   4.05600   -.04350         TABS80 863
   4.10600    .02160   4.22200   -.19720   4.31400   -.17620         TABS80 864
   4.41600    .14600   4.47100   -.00470   4.61800    .25720         TABS80 865
   4.66500   -.20450   4.75600    .06080   4.83100   -.27330         TABS80 866
   4.97000    .17790   5.03900    .03010   5.10800    .21830         TABS80 867
   5.19900    .02670   5.23300    .12520   5.30200    .12900         TABS80 868
   5.33000    .10890   5.34300   -.02390   5.45400    .17230         TABS80 869
   5.51000   -.10210   5.60600    .01410   5.69000   -.19490         TABS80 870
   5.77300   -.02420   5.80000   -.00500   5.80900   -.02750         TABS80 871
   5.86900   -.05730   5.88300   -.03270   5.92500    .02160         TABS80 872
   5.98000    .01080   6.01300    .02350   6.08500   -.06650         TABS80 873
   6.13200    .00140   6.17400    .04930   6.18800    .01490         TABS80 874
   6.18810   -.02000   6.22900   -.03810   6.27900    .02070         TABS80 875
   6.32600   -.00580   6.36800   -.06030   6.38200   -.01620         TABS80 876
   6.40900    .02000   6.45900   -.01760   6.47800   -.00330         TABS80 877
   6.52000    .00430   6.53400   -.00400   6.56200   -.00990         TABS80 878
   6.57500   -.00170   6.60300   -.01700   6.64500    .03730         TABS80 879
   6.68600    .04570   6.71400    .03850   6.72800    .00090         TABS80 880
   6.76900   -.32880   6.76910    .00160   6.81100    .01130         TABS80 881
   6.85200    .00220   6.90800    .00920   6.99100   -.09960         TABS80 882
   7.07400    .03600   7.12100    .00780   7.14300   -.02770         TABS80 883
   7.14900    .00260   7.17100    .02720   7.22600    .05760         TABS80 884
   7.29500   -.04920   7.37000    .02970   7.40600    .01090         TABS80 885
   7.42500    .01860   7.46100   -.02530   7.52500   -.03470         TABS80 886
   7.57200    .00360   7.60000   -.06280   7.64100   -.02800         TABS80 887
   7.66900   -.01960   7.69100    .00680   7.75200   -.00540         TABS80 888
   7.79400   -.06030   7.83500   -.03570   7.87700   -.07160         TABS80 889
   7.96000   -.01400   7.98700   -.00560   8.00100    .02220         TABS80 890
   8.07000    .04680   8.12600    .02600   8.12610   -.03350         TABS80 891
   8.19500   -.01280   8.22300    .06610   8.27800    .03050         TABS80 892
   8.33400    .02460   8.40300    .03470   8.45800   -.03490         TABS80 893
   8.53300   -.03440   8.59600   -.01040   8.63800   -.02600         TABS80 894
   8.73500    .15340   8.81600   -.00280   8.86000    .02330         TABS80 895
   8.88200   -.02610   8.91500   -.00220   8.95600   -.18490         TABS80 896
   9.05300    .12600   9.09500    .03200   9.12300    .09550         TABS80 897
   9.15000    .12460   9.25300   -.03280   9.28900   -.04510         TABS80 898
   9.42700    .13010   9.44100   -.16570   9.51000    .04190         TABS80 899
   9.63500   -.09360   9.70400    .08160   9.81500   -.08810         TABS80 900
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   9.89800    .00640   9.93900   -.00060   9.99500    .05860        TABS80  901
  10.02200   -.07130  10.05000   -.04480  10.05010   -.02210        TABS80  902
  10.10500    .00930  10.10510    .00240  10.18800    .05100        TABS80  903
  10.27200   -.12430  10.38200    .05870  10.42400    .01330        TABS80  904
  10.45200    .03860  10.46500    .11640  10.50700   -.03740        TABS80  905
  10.53400   -.05720  10.64500    .03080  10.70100    .02230        TABS80  906
  10.71400    .05150  10.77000    .09030  10.83900   -.01940        TABS80  907
  10.92200    .04710  10.92210   -.06770  10.96400   -.07940        TABS80  908
  10.99100   -.01200  11.07400    .06080  11.08800   -.02690        TABS80  909
  11.11600   -.04160  11.20700    .02930  11.20710    .05520        TABS80  910
  11.22700    .07560  11.26800    .04310  11.32400    .02080        TABS80  911
  11.43400    .11800  11.57300   -.09990  11.65600   -.12470        TABS80  912
  11.72500   -.20940  11.72510   -.14180  11.78000   -.11630        TABS80  913
  11.80800   0.00000  11.87700    .07620  11.91900    .05700        TABS80  914
  11.98000    .13540  12.04300    .06730  12.11300    .08650        TABS80  915
    1    0                                    1.        /HISTORY    TABS80  916
$                                                                   TABS80  917
$    S A M P L E   P R O B L E M   6                                TABS80  918
$                                                                   TABS80  919
/TABS80 /SAMPLE EXAMPLE 6                                           TABS80  920
/DISCONTINUOUS FLOOR DIAPHRAGMS /SPECIAL STORY LEVEL CONNECTIVITY   TABS80  921
    5    3    7    2    0    0    0    0    0    0    0    0    0   TABS80  922
1.        1.                                                        TABS80  923
LEV 5     5.                                                        TABS80  924
                                                                    TABS80  925
320.                -30.      0.                                    TABS80  926
          320.      -30.      0.                                    TABS80  927
LEV 4     4.                                                        TABS80  928
                                                                    TABS80  929
320.                 30.      0.                                    TABS80  930
          320.       30.      0.                                    TABS80  931
LEV 3     5.                                                        TABS80  932
                                                                    TABS80  933
160.                -30.      0.                                    TABS80  934
          160.      -30.      0.                                    TABS80  935
LEV 2     4.                                                        TABS80  936
                                                                    TABS80  937
160.                 30.      0.                                    TABS80  938
          160.       30.      0.                                    TABS80  939
LEV 1     5.                                                        TABS80  940
                                                                    TABS80  941
0.                    0.      0.                                    TABS80  942
          0.          0.      0.                                    TABS80  943
/25 FOOT WALL CONNECTING TO LEVELS 3 AND 5 AND DUMMY LEVEL 1        TABS80  944
    1    1    3    2    0    0    0    0    0         1             TABS80  945
    5    3    1                                                     TABS80  946
   -1     432000.                                 25.     .666667   TABS80  947
    2     432000.   999999.   999999.                               TABS80  948
    1    1                                                          TABS80  949
    2                                                               TABS80  950
/25 FOOT WALL CONNECTING TO LEVELS 2 AND 4                          TABS80  951
    2    1    2    1    0    0    0    0    0         1             TABS80  952
    4    2                                                          TABS80  953
   -1     432000.                                 25.     .666667   TABS80  954
    1    1                                                          TABS80  955
/50 FOOT WALL CONNECTING TO LEVELS 2,3,4, AND 5                     TABS80  956
    3    1    4    1    0    0    0    0    0         1             TABS80  957
    5    4    3    2                                                TABS80  958
   -1     432000.                                 50.     .666667   TABS80  959
    1    3                                                          TABS80  960
    1     0.        50.       10.       50.       /LINE A (TYPE 1)  TABS80  961
    1     0.        -50.      10.       -50.      /LINE B (TYPE 1)  TABS80  962
    1     -60.      0.        -60.      10.       /LINE 1 (TYPE 1)  TABS80  963
    2     0.        50.       10.       50.       /LINE A (TYPE 2)  TABS80  964
    2     0.        -50.      10.       -50.      /LINE B (TYPE 2)  TABS80  965
    2     60.       0.        60.       10.       /LINE 3 (TYPE 2)  TABS80  966
    3     0.        0.        0.        10.       /LINE 2 (TYPE 3)  TABS80  967
    1    0                    1.0                    /SEISPIC-X     TABS80  968
    2    0                         1.0               /SEISMIC-Y     TABS80  969
END                                                                 TABS80  97C
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